Preliminary Assessment Site Reassessment
Febco Mine
CERCLIS #NMD986674901
North of Prewitt, New Mexico

March, 2008

New Mexico Environment Department
Ground Water Quality Bureau
Superfund Oversight Section

9078384

GROUNDWATER PATHWAY AND TARGETS

Characteristics

Soil Groups

The Clodine-Addicks-Gessner complex is a soil group that is located in all directions surrounding FM 1960 Road and consists of the area where Wunderlich Road well no. 2 is located. This association consists of nearly level, loamy soil on prairies. It occupies about 19 percent of the county. Clodine soils make up about 31 percent of the association, Addicks soils about 27 percent, and Gessner soils about 18 percent. Wockley, Katy, and Aris soils make up the rest (Ref. 18).

Clodine-Addicks-Gessner association is considered poorly drained, moderately permeable soils.

1. The Clodine soils occur in smooth, nearly level areas and as pimple mounds in areas slightly above the Addicks soils. Addicks soils are smooth and nearly level in most places. The Gessner soils are in depressions. The Clodine soils have a friable, dark gray loam surface layer about 12 inches thick that is neutral in the upper part and moderately alkaline in the lower part. The next layer is friable, moderately alkaline in the lower part. The next layer is friable, moderately alkaline gray loam about 17 inches thick. The layer below that, extending to a depth of 72 inches, moderately alkaline, light brownish gray loam that has irregular shape, pitted calcium carbonate concretions (Ref.18).

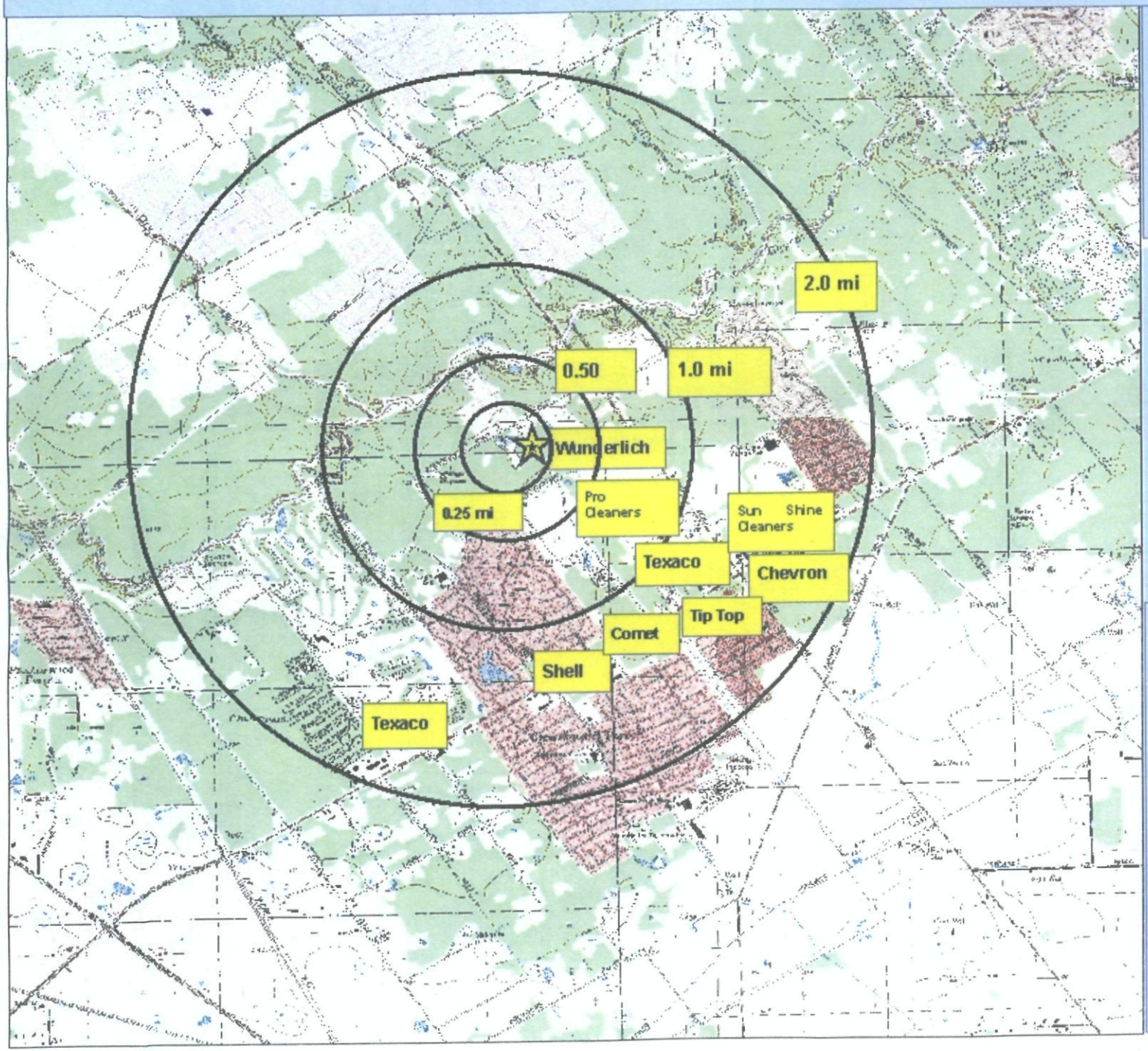
2. The Addicks soils have a friable, neutral, black loam surface layer about 11 inches thick. The layer below that is friable, neutral, dark gray loam about 12 inches thick. The next layer is about 26 inches thick and consists of friable, moderately alkaline, light gray loam that is about 20 percent, by volume, visible calcium carbonate. The layer at a depth of 49 inches is firm, moderately alkaline, light gray loam that has distinct yellow and yellowish brown mottles and about 5 percent visible calcium carbonate (Ref. 18).

Wockley- Gessner association is considered somewhat poorly drained and poorly drained, moderately slowly permeable and moderately permeable soils. It occupies about 15 percent of the county. Wockly soils make up about 55 percent of the association, and Gessner soils make up about 22 percnet. Addicks, Katy, and Aris soils make up the rest.

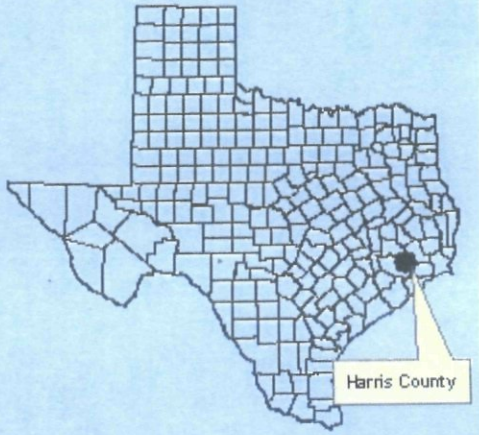
3. The Gessner soil has a surface layer of friable, slightly acid, dark grayish brown loam about seven inches thick. The layer below that is about 9 inches thick and is friable, slightly acid, grayish brown loam. It tongues into the next layer, which is friable, neutral, dark gray loam that is slightly more clayey. That layer extends to a depth of 34 inches. The layer below that is friable, moderately alkaline, light brownish gray loam about 19 inches thick. Below that, extending to a depth of 84 inches, is a layer of firm, moderately alkaline, light gray sandy clay loam that has distinct mottles of yellowish brown and brownish yellow (Ref. 18).

4. The Wockly soils have a surface layer of friable, strongly acid, dark grayish brown fine sandy loam about 7 inches thick. The next layer is friable, medium acid, brown fine sandy loam about 15 inches thick. The layer below that is about 11 inches thick and consists of firm strongly acid, brown sandy clay loam that has mottles of yellowish brown, red, and light brownish gray. The next layer extends to a depth of 60 inches; it is firm, medium acid, light brownish gray, sandy clay loam that has mottles of yellowish brown and red. It is about 12 percent plinthite (Ref. 18).

Figure 3 Page 9 Heatherlcoh MUD Nearby Industries



TCEQ



Heatherloch MUD Ground Water Plume Spring, N W Harris County Texas

N

0 0.4 0.8 1.6 Miles

Required Information (Data Gaps)

- Field verify the site features and locations.
- Field verify the locations of potential sources of the contaminants.
- Field verify previous/current waste management activities conducted in the vicinity of the contaminated well and obtain information on hazardous substances related to these activities through observation and interviews with on-site personnel, nearby business owners or long-term nearby residents.

WASTE CONTAINMENT/HAZARDOUS SUBSTANCE IDENTIFICATION

Characteristics

The information used to identify the waste characteristics at Wunderlich Road Ground Water Plume site was obtained from field inspection and review of TCEQ Region 12 files. The site is designated as a contaminated ground water plume originating from an unknown source where hazardous substances may have seeped through the ground to the aquifer.

Based on the results of the drinking water samples collected from April 1999 to July 2006 of PWS # 1010548, Well No. 2, the site is reported to contain volatile organic compound, benzene (Ref.13). However, this level has not been stable over the period.

The following six service stations were located within a mile radius to the south of PWS # 1010548 Well No. 2 on FM 1960: Shell Oil, Texaco Food Mart, Paradise Valley Food Mart Conoco, Chevron, Speedy Stop, Champions Texaco Service Center and Shell Oil (Ref. 16).

A search of Texas Railroad Commission web site indicated that the following underground pipelines moving crude oil, natural gas and gasoline are present in the area of the site: BP Pipelines (North America), Inc (crude oil), Houston Pipeline Company (natural gas), Houston Natural Gas Pipeline (2), TEPPCO Crude Pipeline. L.P. (crude oil), Gulf South Pipeline, LP (natural gas), Copano Pipeline (natural gas), Mobile Pipeline Company (gasoline), Tennessee Gas Pipeline (natural gas), Universal Natural Gas Inc. (natural gas) and BP Pipeline (crude oil) (Ref. 17).

A Google! Nearby Business search revealed the following dry cleaners and automotive repair and paint and body shop businesses from the search of 14402 Benfer Street Spring, Texas address of PWS #1010548, Well no. 2 (approximate distance from the well is in the parenthesis): Pro Cleaners at 14850 Wunderlich Drive (0.4 miles), Tip Top Cleaners at 4960 FM 1960 Road (0.6 miles), 1.19 Qt Cleaners at 4950 FM 1960 Road (0.6 miles), Comet Cleaners at 5788 FM 1960 Road (0.8 miles), Fashion Fair Cleaners at 5137 FM 1960 Road (0.5 miles), Expert Cleaners at 4950 FM 1960 Road (0.5 miles), Expert Cleaners at 4950 FM 1960 (0.6 miles), One Hour Champion Dry Cleaning at 5419 FM 1960 Road (0.6 miles), Ann Tailor Sunshine Cleaners at 14243 Stuebner Airline Drive (0.7 mile) and Rosewood Cleaners at 4509 FM 1960 Road (0.8 miles), Apollo Paint & Body Shop at 6455 FM 1960 (1.5 mile), Cillis Car Care & Body Shop at Willobrook area (2.8 mile), Roadrunner Body Shop at 12402 Ann Ln. (3.5 mile), Klein Paint & Body Shop at 5123 Squash Street (3.7 mile), Body Shop The at 18955 Kuykendahl Road (4.1 mile), and Performance Body Shop at 16920 Kuykendahl Road (3.2 mile) (Ref. 17).

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1 Introduction

Under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended, 42 United States Code (U.S.C.) §§ 9601 to 9675 (CERCLA), the New Mexico Environment Department (NMED), Superfund Oversight Section (SOS) conducted a Preliminary Assessment (PA) Site Reassessment at the Febco Mine (Site) in McKinley County (CERCLIS #: NMD986674901). The objective of the PR is to evaluate the Site using the Hazard Ranking System (Ref. 1) and the Superfund Chemical Data Matrix (SCDM) (Ref. 2) to determine if a threat to human health and the environment exists such that further action under CERCLA is warranted. This PA Site Reassessment reviews current information pertaining to the site to determine if factors have changed since the PA was performed in 1991 and to determine if sampling consistent with a Site Inspection is warranted. The PA Site Reassessment was initiated at the request of the Navajo Nation Superfund Program (NSP) with concurrence of the United States Environmental Protection Agency (EPA) Region 6.

2 Site Information

2.1 Location

The Site is an abandoned uranium mine located approximately 11 miles northeast of Prewitt in McKinley County, Township 14 North, Range 10 West, Section 31 (Figure 1). The Site may be reached by traveling east on U.S. 66 for 2.7 miles from the Prewitt post office. Turn north at the sign for Haystack; this road is an unimproved dirt road that goes under the railroad tracks (Ref. 3 p. 1; Ref. 4 p. 18). Travel northeast for approximately 9 miles to an east-west trending fence (Ref. 3 p.1). This fence separates Indian allotment land from private land. The Site is approximately two-tenths of a mile north of the fence on private property. The site is located at latitude 35° 23' 36" North, longitude 107° 56' 26" West (Ref. 5 p. 1).

2.2 Physical Description

This Site is an abandoned uranium mine which originally included four adits and two uncapped, unstablized waste rock piles (Ref. 3 p. 2) (Figure 2). The waste rock piles contain low-grade ore (Ref. 3 p. 2). The adits are driven into the mesa cliff composed of the Cretaceous Dakota Sandstone (Ref. 6 p. 2). Potential contaminants include the heavy metals selenium, lead, arsenic, barium, molybdenum, uranium, and vanadium and radionuclides radon, radium, bismuth thorium, and polonium (Ref. 7 p. 2).

Fine black particles have been observed in the soil on the valley floor and in the waste piles (Ref. 3 p. 2 and Ref. 4 p. 5). The black particles probably are derived from the geological unit from which the ore was removed from as the mine is located in a carbonaceous shale zone (Ref. 3 p. 3).

2.3 Site Ownership and Potential Responsible Parties

The Site is within Township 14 North, Range 10 West, Section 31. This section of land was granted to the Santa Fe Railroad from the U.S. government along with mineral rights except for coal, oil and gas (Ref. 8 p. 1). The land was then sold to W.A. Berryhill in 1946 (Ref. 8 p. 2). In 1960, Fanny Mae Berryhill owned the property (Ref. 8 p. 2). In 1991, the section was still owned by a Berryhill (Ref. 9 p. 1). In 2005, the property was

owned by Dave P. Elkins, Rev. Trust (Ref. 10 p. 2).

Febco Mine was opened in 1952 with production continuing at least through 1958 (Ref. 11 p. 1). The section of land was leased to Duane Berryhill and L. Elkins in 1951 (Ref. 8 p. 2). Other lessees have included Silver Spur Mining Company, Holly Minerals, Febco Mines and A. M. Berryhill (Ref. 8 p. 2; Ref. 12 p. 2).

2.4 Previous Investigations

The New Mexico Bureau of Geology and Mineral Resources (formerly known as the New Mexico Bureau of Mines and Minerals) investigated the Site in 1979 for a published report titled "Abandoned or Inactive Uranium Mines in New Mexico" (Ref. 11 p. 123). The NSP submitted a site discovery form for the Site in 1990 (Ref. 6 p.3). NMED developed and submitted a PA to EPA, Region 6 for the Site in 1991 (Ref. 3). The NSP developed an Abbreviated PA report for the Site in 2001 which was submitted to EPA Region 9 (Ref. 13).

3 Site Investigation

3.1 Site Reconnaissance

On March 22, 2005, Robin Brown and Jake Ingram, NMED, performed a site reconnaissance. Stanley Edison and Jerry Begay, from the NSP accompanied NMED staff on this reconnaissance. During the reconnaissance, investigators recorded field notes, took photographs and collected geographic positioning system (GPS) measurements (Ref. 4; Ref. 14 p. 4-5). Jerry Begay, NSP surveyed gamma radiation with a microR meter and NMED staff recorded data (Ref. 4 p. 1 to 21).

On May 6, 2005, Robin Brown returned to the site to document the number of houses at the nearby community and to locate the community on the topographic map (Ref. 4 p. 10).

3.2 Site Pathway Summary

3.2.1 Source/Waste Characteristics

This Site is an abandoned uranium mine with two waste rock piles containing some low-grade ore and areas of contaminated soil. The approximate combined area of the waste piles and rock piles is 11,800 square feet and the approximate area of the contaminated soil is 129,039 square feet. The area of the waste rock piles was estimated based on GPS-data collected during the field reconnaissance. The area of contaminated soil was estimated based on field observations of fine black particles on the soil surface within the flat area surrounding the waste rock piles and flat topography shown on the topographic map (Ref. 4 p. 4-5; Ref. 15 p. 1-3).

3.2.2 Air Exposure Pathway

Pathway description: The prevailing wind direction in the Grants area is from the west and the winds of the highest velocity are generally from the west/southwest (Ref. 3 p. 6). Given the semi-arid conditions, lack of vegetative cover and the fine grained material of the waste rock piles the potential is high for winds to carry fugitive dust and contaminates from the Site.

Targets: There are no known on-site targets. The nearest residents live approximately ¾ *mile* south/southeast from the site (Figure 2, Figure 3) (Ref. 3 p. 6). These

residences may be exposed to elevated concentrations of radon and windblown waste from the site (Ref. 3 p. 7). There are approximately 93 people that live between ½ and 1 mile from the site (Table 1). Between 265 and 500 persons live within 4 miles of the mine (Table 1) (Ref. 3 p. 6).

3.2.3 Surface Water Pathway

Pathway Description: The Site is located on the north side of a small east-west trending drainage channel (Figure 2) (Ref. 11 p. 1). The drainage was dry during the 2005 field reconnaissance (Ref. 4 p. 22) and the designation of the flow regime on the topographic map suggest that surface water flow is ephemeral (Ref. 20). There are several stock tanks within the ephemeral drainage downstream that would collect runoff from the mine site (Ref. 20). These stock tanks also could collect contaminated sediments from the mine site (Ref. 4 p. 11).

Targets: There are no drinking water intakes within 15 miles of the site (Ref. 3 p. 6). Surface water is used for watering livestock that graze near the site (Figure 2). Potentially contaminated water from the Site that accumulates in stock tanks within the ephemeral drainage could pose a hazard to cattle and wildlife as well as community residents that may have contact with the water. Possible targets which includes a small residential area located near the drainage to the south (within 1 mile) of the site, an early childhood development center within 2 miles and further south the community of Haystack within 4 miles of the site (Figure 3) (Ref. 3 p. 6; Ref. 4 p. 10). There are 6 federally designated sensitive environments located within 4 miles of the Site (Ref. 16 p. 2). These sensitive environments are all located within the drainage downstream of the Site with the closest one being within 1 mile of the Site (Ref. 16 p. 2). Also, there are listed (endangered, threatened and candidate) fauna and flora species in the area (Ref. 7 p. 4).

3.2.4 Soil Exposure Pathway

Pathway Description: Fine black particles brought up from the mine were observed in the soil in the flat area below the waste rock piles (Ref. 4 p. 5). The estimated contaminated soil area is 129,039 square feet based on field observations and topography shown on the topographic map (Ref. 15 p. 1-3); however, the area may actually be much larger, as contaminated soil may have blown downwind and/or been carried by water down the drainage. No soil sampling has been conducted at the site. During the March 2005 field visit, gamma radiation was measured one meter above the ground surface (Ref. 4 p. 4). Gamma radiation readings taken off-site varied from 10 to 18 u-roentgens per hour (uR/hr.) (Ref. 4 p. 17). Readings at the waste rock piles and adits varied from 40 to 150 uR/hr.; the highest reading was in the flat area away from the waste rock piles (Ref. 4 p. 17). These readings indicate that the gamma radiation at the Site is more than three-times off-site levels and that the contamination has spread to areas beyond the waste rock piles.

Targets: There are no residences, work places, schools or day care, and no known sensitive environments within ½ mile of the site. A daycare is located between one and two miles from the site (Figure 3). Except for a fence that is easily climbed, there are no barriers restricting access to the site (Ref. 4 p. 3). The nearest person lives approximately ¾ mile from the site (Ref.17). There are approximately 93 people that live from ½ to 1 mile from the site (Table 1). Between 265 and 500 persons live within

4 miles of the mine (Table 1) (Ref. 3 p. 6). Livestock graze in the Site vicinity (Ref. 3 p. 7; Ref. 4 p. 7). There are 6 federally designated sensitive environments located within 4 miles, downstream of the Site (Ref. 16 p. 2). Also, there are listed (endangered, threatened and candidate) fauna and flora species in the area (Ref. 7 p. 4).

3.2.5 Ground Water Pathway

Pathway Description: The Dakota Formation outcrops at the Site (Ref. 3 p. 3). This formation is underlain by the Morrison formation, the San Rafael Group and the Wingate Sandstone and Chinle Formation (Ref. 3 Figure 6). None of these formations contain karst features in the area (Ref. 3 Appendix E).

The depth to water is 365 feet below ground surface in well #16T-521 that is 2.5 miles from the site (Figure 3) (Ref. 18 p. 3). This is a stock well that also may be used as a drinking water supply (Ref. 5 p. 3). The depth to water in the community well, Haystack Well #1 or 16T-551, is 446 feet below ground surface (Ref. 18 p. 3). This well has a total depth of 1,083 feet below ground surface (Ref. 18 p. 3) and draws water from a depth of approximately 1,000 feet below ground surface (Ref. 3 p. 5). This well is located between three and four miles from the site (Figure 3).

Because the Haystack Well #1 supplies a public water system, it is sampled periodically. Detected results from sampling are shown in Table 2. None of the substances sampled are above Navajo Nation, state, federal, or health-based benchmarks. In 1989, gross alpha concentrations were detected at 12.3±5.99 picocuries per liter (pCi/L) in a water sample collected from the Haystack Well #1 (Ref. 19). This concentration may exceed the federal maximum contaminant level (MCL) of 15 pCi/L; however, the gross alpha concentrations detected in samples collected in 1999 and 2003 have been well below the MCL (Table 2).

Targets: Ground water in the area is used for drinking water, stock water, and irrigation. The closest drinking water well, stock well 16T-521 is located between two and three miles from the site (Figure 3) (Ref. 7 p. 3). This well may serve up to 85 people (Ref. 7 p. 3). The community well, Haystack Well # 1 or 16T-551, serves 500 people and is located between three and four miles from the site (Figure 3, Table 3) (Ref. 7 p. 3). There are two other stock wells 16B-38 and 16T-552, and one well of unknown status, Karmac 004, that are located within four miles of the Site (Figure 3) (Ref. 18 p. 3). Also, the buildings shown on the topographic map (Ref. 20) may be residences that are outside of the distribution system for the community well (Table 3).

4 Summary and Conclusions

The Site is an abandoned uranium mine that may have contaminated air, ground water, soil, surface water and sediments. None of these pathways has been sampled. Potential contaminants include the heavy metals selenium, lead, arsenic, barium, molybdenum, uranium, and vanadium and radionuclides radon, radium, bismuth thorium, and polonium (Ref. 7 p. 2).

The closest residence is about ¾ mile from the site (Ref. 17) and the closest well that may be used for drinking water is located between two and three miles from the site (Figure 3). There is also a community supply well located between three and four miles from the site (Figure 3). This well has been sampled and, during the last two sampling events in 1999 and 2003, has not had analytes above the Navajo nation

ground water standard, state ground water standards, federal drinking water standards, or health-based benchmarks (Ref. 18). Possible exposure may result from people visiting the Site, as Site access is not restricted; or by contaminant transport via surface water, wind, or ground water to occupied areas.

Sample collection of the following areas would help determine if the site poses a threat to human health and the environment:

- Source samples of waste rock piles and soil on the Febco Mine.
- Arroyo sediments near the community of Haystack.
- Surface water and sediment samples from stock tanks down gradient from mine site.
- Background sediment values upstream of the mine
- Soil within two feet of the surface from yards in the nearby community.
- Background soil.
- Ground water from the nearest wells 16T-521 and 16B-38.
- Background ground water wells should be identified if possible and sampled.

5 References

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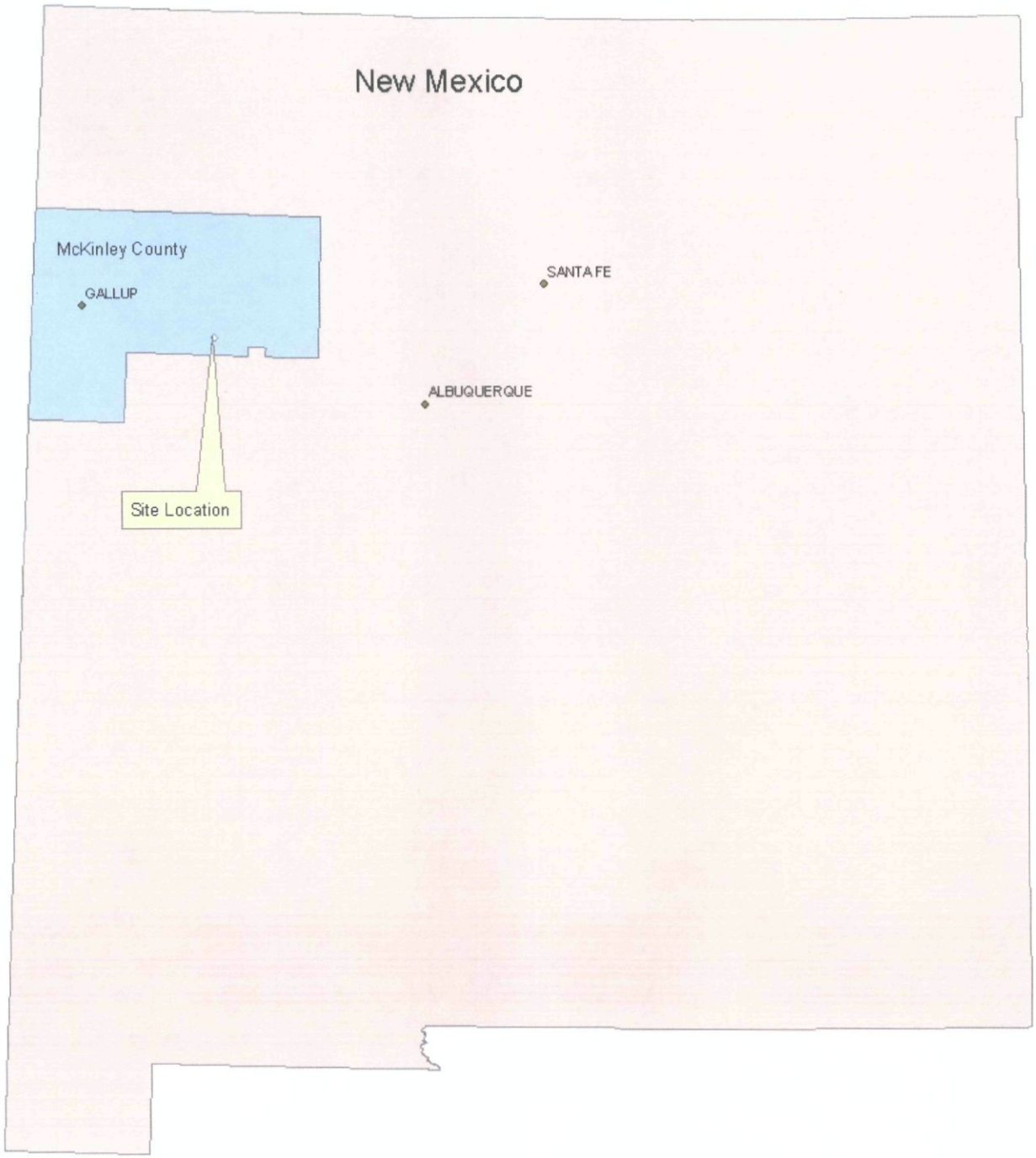
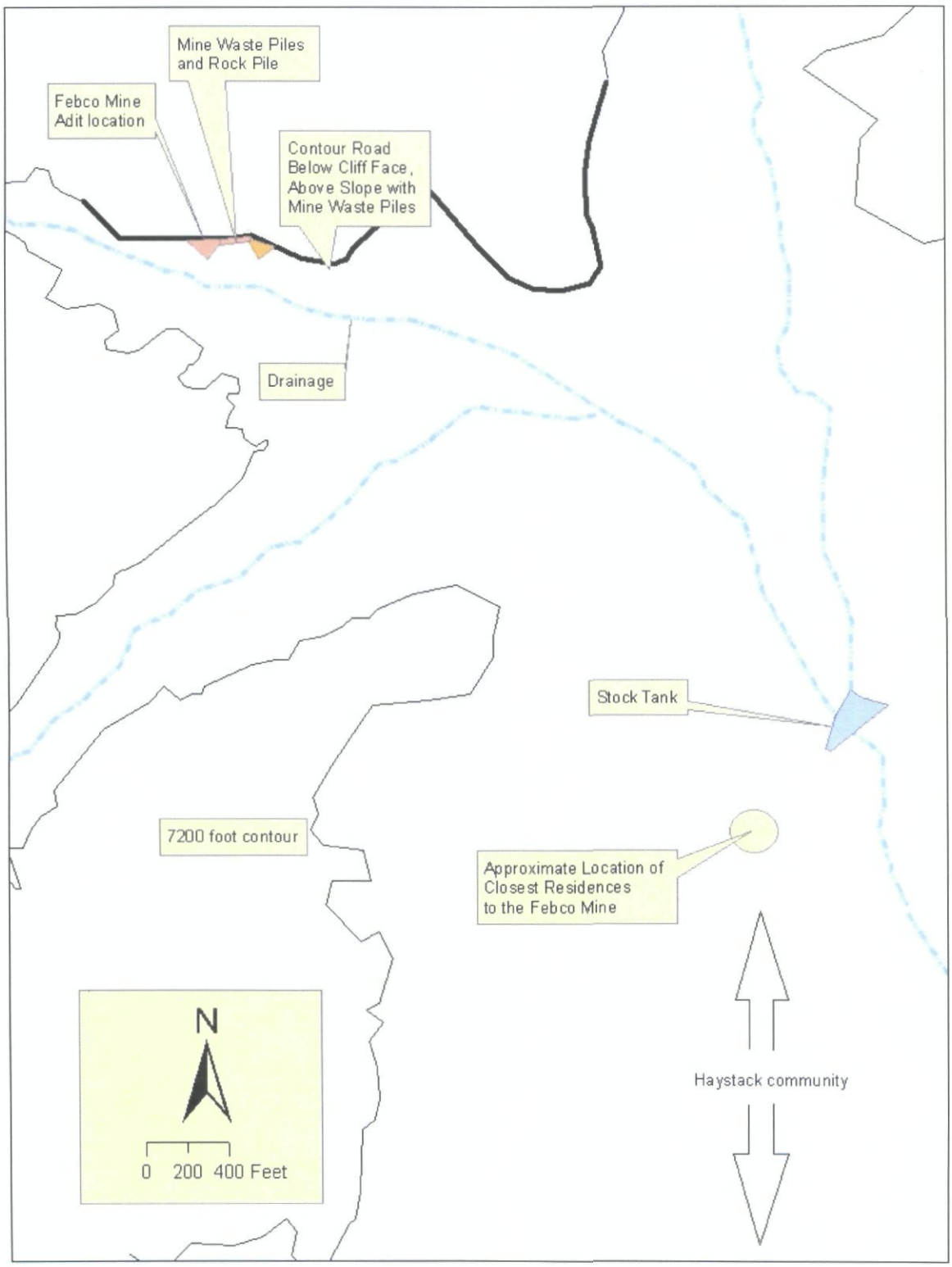
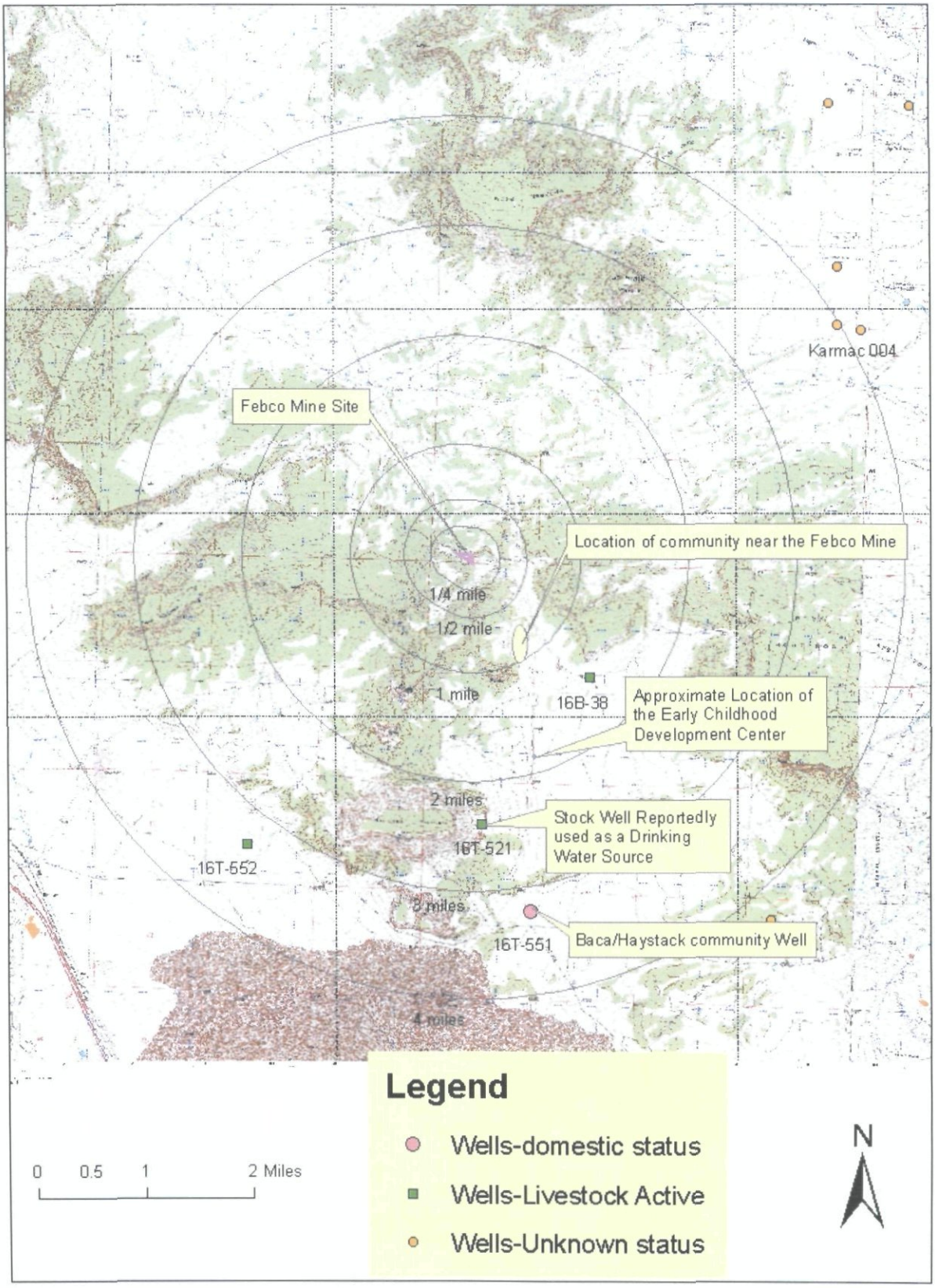


Figure 1. Location of the Febco Mine Site within McKinley County, New Mexico.



Ref. 4 p. 4, 10, and 14; Ref. 20.

Figure 2. Site Sketch.



Ref. 18 p. 3, 5 and 7; Ref. 4 p. 12; Ref. 7 p. 3; Ref. 20; Ref. 27.

Figure 3. Four Mile Radius Map.

Table 1. Number of People Within Each Target Distance Ring of the Febco Mine Site.

Target Distance Limit from Site	Approximate Number of buildings[a]	Estimated Population Served per TDL[b]
0 – 1/4 Mile	0	0
1/4 - 1/2 Mile	0	0
1/2 - 1 Mile	25	93.5
1 -2 Miles	5	18.7
2 -3 Miles	30	112.2
3 - 4 Miles	11	41.1
	Total:	265.5

a The building estimate includes the buildings counted from the topographic map and from the field visit (Ref. 4 p. 10; Ref. 17 p. 5).

b In McKinley County, there are 3.44 people per household and on Navajo Nation Reservation and Off-Reservation Trust Land, there are 3.74 people per household (Ref. 21 p. 2 and 5). To determine the population within each TDL, multiply the number of buildings counted in the TDL by 3.74, to yield the conservative population estimate.

Table 2. Detected Analytes in Ground Water Samples Collected from the Haystack Well #1.

Analyte[b]	Navajo Nation Ground Water Standard (mg/L unless noted) (Ref. 22)	Federal MCL ((mg/L unless noted) (Ref. 2; Ref. 23)	NMWQCC Ground Water standard (mg/) (Ref. 24)	Reference Does Screen Concentration ((mg/L) (Ref. 2)	Sample Collection Date[c]	Concentration (mg/L unless otherwise stated[d])	Concentration Reference
Barium	2	2	1	2.6	7/1989	0.09	19
					11/10/1998	0.029	18 p. 8
Cadmium	0.005	0.005	0.01	0.018	7/1989	0.001	19
Chromium	0.1	0.1	0.05	0.11	7/1989	0.002	19
					11/10/1998	0.001	18 p. 8
Iron	None	None	1.0	None	7/1989	0.047	19
Lead	0.015	0.015	0.05	None	7/1989	0.003	19
Manganese	None	None	0.2	5.1	7/1989	0.008	19
Mercury	0.002	0.002	0.002	0.011	7/1989	0.001	19
Selenium	0.05	0.05	0.050	0.18	7/1989	0.007	19
					11/10/1998	0.003	18 p. 9
Nitrate	10	10	10	NL	3/15/2004[a]	0.31	18 p. 14
Di(2-ethylhexyl) adipate	0.4	0.4	NL	None	12/16/1998	0.0001	18 p. 21
Gross Alpha w/Am-241	15 pico-curies (pCi)/L	15 pCi/L	NL	None	7/1989	**12.3 ± 5.99 pCi/L**	19
					12/02/1999	1.9	18 p.25
					11/17/2003	1.8	18 p. 25
Radium-226	5 pCi/L	5pCi/L	30 pCi/L	None	7/1989	0.419 pCi/L	19

NL = Not listed

a. Sample collected from Haystack Pump House WD.
b. Full Suites of the following were analyzes: Inorganic chemicals, nitrate and nitrite, volatile organic compounds (VOC), synthetic organic chemicals (SOCs).
c. Samples reviewed for the following dates: Inorganic chemicals: 11/1998, 7/1989; Nitrate Nitrite: 09/1998, 09/1999, 12/2001, 9/2003, 3/2004, 5/2005; VOC: 12/1998, 9/2001, 10/2004; SOC: 12/1998, 9/2001 and 10/2004; and radiologicals: 12/1999 and 11/2003 (Ref. 18 p. 7, 13, 15, 19 and 25; Ref. 19).
d. Sample concentrations are provided in Reference 18. Concentration units are provided in Reference 24 and Reference 25.

Table 3. Number of Private and Community Drinking Water Wells and Receptors Within Each Target Distance Ring of the Febco Mine Site.

	Community Supply Wells		Domestic Wells		
Target Distance Limit from Site	Well Names[a]	Population Served[b]	Number of wells; number of buildings not in Haystack Well Distribution Area[c]	Estimated Population Served[d]	Estimated Total Population Served per TDL
0 – 1/4 Mile	No wells	0	0; 0	0	0
1/4 - 1/2 Mile	No Wells	0	0; 0	0	0
1/2 - 1 Mile	No Wells	0	0; 0	0	0
1 -2 Miles	No wells	0	0; 1	3.7	3.7
2 -3 Miles	Stock well (16T-521)	85	0; 3	11.2	96.2
3 - 4 Miles	Haystack Well #1 (16T-551)	500	1; 8	29.9	529.9
				Total Population:	629.8

a. The well locations are shown in Figure 3.
b. The population served by Haystack Well #1 is given in reference 18 p. 5. Stock well 16T-521 in combination with a surface spring that is greater than 4 miles from the site may also serve up to 85 people (Ref. 7 p. 3).
c. The number wells was compiled by adding the number of known domestic wells and the wells with unknown status (Ref. 18; Ref. 26). The number of buildings was determined by adding the buildings marked in each target distance ring on the topographic map (Ref. 17).
d. In McKinley County, there are 3.44 people per household and on Navajo Nation Reservation and off-reservation trust land, there are 3.74 people per household (Ref. 21 p. 2 and 5). To determine the population served by domestic wells within each TDL, the number of wells or number of buildings counted in the TDL was multiplied by 3.74, using the number that yields a higher population estimate in each case.

REFERENCE 1

Ref 1

federal register

Friday
December 14, 1990

Part II

Environmental Protection Agency

40 CFR Part 300
Hazard Ranking System; Final Rule

Appendix A to Part 300—The Hazard Ranking System

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those of its parent isotope, and may also be radioactive.

Detection Limit (DL): Lowest amount that can be distinguished from the normal random "noise" of an analytical instrument or method. For HRS purposes, the detection limit used is the method detection limit (MDL) or, for real-time field instruments, the detection limit of the instrument as used in the field.

Dilution weight: Parameter in the HRS surface water migration pathway that reduces the point value assigned to targets as the flow or depth of the relevant surface water body increases. [unitless].

Distance weight: Parameter in the HRS air migration, ground water migration, and soil exposure pathways that reduces the point value assigned to targets as their distance increases from the site. [unitless].

Distribution coefficient (K_d): Measure of the extent of partitioning of a substance between geologic materials (for example, soil, sediment, rock) and water (also called partition coefficient). The distribution coefficient is used in the HRS in evaluating the mobility of a substance for the ground water migration pathway. [ml/g].

ED_{10} (10 percent effective dose): Estimated dose associated with a 10 percent increase in response over control groups. For HRS purposes, the response considered is cancer. [milligrams toxicant per kilogram body weight per day (mg/kg-day)].

Food and Drug Administration Action Level (FDAAL): Under section 408 of the Federal Food, Drug and Cosmetic Act, as amended, concentration of a poisonous or deleterious substance in human food or animal feed at or above which FDA will take legal action to remove adulterated products from the market. Only FDAALs established for fish and shellfish apply in the HRS.

Half-life: Length of time required for an initial concentration of a substance to be halved as a result of loss through decay. The HRS considers five decay processes: biodegradation, hydrolysis, photolysis, radioactive decay, and volatilization.

Hazardous substance: CERCLA hazardous substances, pollutants, and contaminants as defined in CERCLA sections 101(14) and 101(33), except where otherwise specifically noted in the HRS.

Hazardous wastestream: Material containing CERCLA hazardous substances (as defined in CERCLA section 101(14)) that was deposited, stored, disposed, or placed in, or that otherwise migrated to, a source.

HRS *"factor":* Primary rating elements internal to the HRS.

HRS *"factor category":* Set of HRS factors (that is, likelihood of release [or exposure], waste characteristics, targets).

HRS *"migration pathways":* HRS ground water, surface water, and air migration pathways.

HRS *"pathway":* Set of HRS factor categories combined to produce a score to measure relative risks posed by a site in one of four environmental pathways (that is, ground water, surface water, soil, and air).

HRS *"site score":* Composite of the four HRS pathway scores.

Henry's law constant: Measure of the volatility of a substance in a dilute solution of water at equilibrium. It is the ratio of the vapor pressure exerted by a substance in the gas phase over a dilute aqueous solution of that substance to its concentration in the solution at a given temperature. For HRS purposes, use the value reported at or near 25° C. [atmosphere-cubic meters per mole ($atm\text{-}m^3/mol$)].

Hydrolysis: Chemical reaction of a substance with water.

Karst: Terrain with characteristics of relief and drainage arising from a high degree of rock solubility in natural waters. The majority of karst occurs in limestones, but karst may also form in dolomite, gypsum, and salt deposits. Features associated with karst terrains typically include irregular topography, sinkholes, vertical shafts, abrupt ridges, caverns, abundant springs, and/or disappearing streams. Karst aquifers are associated with karst terrain.

LC_{50} (lethal concentration, 50 percent): Concentration of a substance in air [typically micrograms per cubic meter ($\mu g/m^3$)] or water [typically micrograms per liter ($\mu g/l$)] that kills 50 percent of a group of exposed organisms. The LC_{50} is used in the HRS in assessing acute toxicity.

LD_{50} (lethal dose, 50 percent): Dose of a substance that kills 50 percent of a group of exposed organisms. The LD_{50} is used in the HRS in assessing acute toxicity [milligrams toxicant per kilogram body weight (mg/kg)].

Maximum Contaminant Level (MCL): Under section 1412 of the Safe Drinking Water Act, as amended, the maximum permissible concentration of a substance in water that is delivered to any user of a public water supply.

Maximum Contaminant Level Goal (MCLG): Under section 1412 of the Safe Drinking Water Act, as amended, a nonenforceable concentration for a substance in drinking water that is protective of adverse human health effects and allows an adequate margin of safety.

Method Detection Limit (MDL): Lowest concentration of analyte that a method can detect reliably in either a sample or blank.

Mixed radioactive and other hazardous substances: Material containing both radioactive hazardous substances and nonradioactive hazardous substances, regardless of whether these types of substances are physically separated, combined chemically, or simply mixed together.

National Ambient Air Quality Standards (NAAQS): Primary standards for air quality established under sections 108 and 109 of the Clean Air Act, as amended.

National Emission Standards for Hazardous Air Pollutants (NESHAPs): Standards established for substances listed under section 112 of the Clean Air Act, as amended. Only those NESHAPs promulgated in ambient concentration units apply in the HRS.

Octanol-water partition coefficient (K_{ow} [or P]): Measure of the extent of partitioning of a substance between water and octanol at equilibrium. The K_{ow} is determined by the ratio between the concentration in octanol divided by the concentration in water at equilibrium. [unitless].

Organic carbon partition coefficient (K_{oc}): Measure of the extent of partitioning of a substance, at equilibrium, between organic carbon in geologic materials and water. The higher the K_{oc}, the more likely a substance is to bind to geologic materials than to remain in water. [ml/g].

Photolysis: Chemical reaction of a substance caused by direct absorption of solar energy (direct photolysis) or caused by other substances that absorb solar energy (indirect photolysis).

Radiation: Particles (alpha, beta, neutrons) or photons (x- and gamma-rays) emitted by radionuclides.

Radioactive decay: Process of spontaneous nuclear transformation, whereby an isotope of one element is transformed into an isotope of another element, releasing excess energy in the form of radiation.

Radioactive half-life: Time required for one-half the atoms in a given quantity of a specific radionuclide to undergo radioactive decay.

Radioactive substance: Solid, liquid, or gas containing atoms of a single radionuclide or multiple radionuclides.

Radioactivity: Property of those isotopes of elements that exhibit radioactive decay and emit radiation.

Radionuclide/radioisotope: Isotope of an element exhibiting radioactivity. For HRS purposes, "radionuclide" and "radioisotope" are used synonymously.

Reference dose (RfD): Estimate of a daily exposure level of a substance to a human population below which adverse noncancer health effects are not anticipated. [milligrams toxicant per kilogram body weight per day (mg/kg-day)].

Removal action: Action that removes hazardous substances from the site for proper disposal or destruction in a facility permitted under the Resource Conservation and Recovery Act or the Toxic Substances Control Act or by the Nuclear Regulatory Commission.

Roentgen (R): Measure of external exposures to ionizing radiation. One roentgen equals that amount of x-ray or gamma radiation required to produce ions carrying a charge of 1 electrostatic unit (esu) in 1 cubic centimeter of dry air under standard conditions. One microroentgen (μR) equals 10^{-6} R.

Sample quantitation limit (SQL): Quantity of a substance that can be reasonably quantified given the limits of detection for the methods of analysis and sample characteristics that may affect quantitation (for example, dilution, concentration).

Screening concentration: Media-specific benchmark concentration for a hazardous substance that is used in the HRS for comparison with the concentration of that hazardous substance in a sample from that media. The screening concentration for a specific hazardous substance corresponds to its reference dose for inhalation exposures or for oral exposures, as appropriate, and, if the substance is a human carcinogen with a weight-of-evidence classification of A, B, or C, to that concentration that corresponds to its 10^{-6} individual lifetime excess cancer risk for inhalation exposures or for oral exposures, as appropriate.

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1.0 Introduction

The Hazard Ranking System (HRS) is the principal mechanism the U.S. Environmental Protection Agency (EPA) uses to place sites on the National Priorities List (NPL). The HRS serves as a screening device to evaluate the potential for releases of uncontrolled hazardous substances to cause human health or environmental damage. The HRS provides a measure of relative rather than absolute risk. It is designed so that it can be consistently applied to a wide variety of sites.

1.1 Definitions

Acute toxicity: Measure of toxicological responses that result from a single exposure to a substance or from multiple exposures within a short period of time (typically several days or less). Specific measures of acute toxicity used within the HRS include lethal dose$_{50}$ (LD_{50}) and lethal concentration$_{50}$ (LC_{50}), typically measured within a 24-hour to 96-hour period.

Ambient Aquatic Life Advisory Concentrations (AALACs): EPA's advisory concentration limit for acute or chronic toxicity to aquatic organisms as established under section 304(a)(1) of the Clean Water Act, as amended.

Ambient Water Quality Criteria (AWQC): EPA's maximum acute or chronic toxicity concentrations for protection of aquatic life and its uses as established under section 304(a)(1) of the Clean Water Act, as amended.

Bioconcentration factor (BCF): Measure of the tendency for a substance to accumulate in the tissue of an aquatic organism. BCF is determined by the extent of partitioning of a substance, at equilibrium, between the tissue of an aquatic organism and water. As the ratio of concentration of a substance in the organism divided by the concentration in water, higher BCF values reflect a tendency for substances to accumulate in the tissue of aquatic organisms. [unitless].

Biodegradation: Chemical reaction of a substance induced by enzymatic activity of microorganisms.

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (Pub. L. 96–510, as amended).

Chronic toxicity: Measure of toxicological responses that result from repeated exposure to a substance over an extended period of time (typically 3 months or longer). Such responses may persist beyond the exposure or may not appear until much later in time than the exposure. HRS measures of chronic toxicity include Reference Dose (RfD) values.

Contract Laboratory Program (CLP): Analytical program developed for CERCLA waste site samples to fill the need for legally defensible analytical results supported by a high level of quality assurance and documentation.

Contract-Required Detection Limit (CRDL): Term equivalent to contract-required quantitation limit, but used primarily for inorganic substances.

Contract-Required Quantitation Limit (CRQL): Substance-specific level that a CLP laboratory must be able to routinely and reliably detect in specific sample matrices. It is not the lowest detectable level achievable, but rather the level that a CLP laboratory should reasonably quantify. The CRQL may or may not be equal to the quantitation limit of a given substance in a given sample. For HRS purposes, the term CRQL refers to both the contract-required quantitation limit and the contract-required detection limit.

Curie (Ci): Measure used to quantify the amount of radioactivity. One curie equals 37 billion nuclear transformations per second, and one picocurie (pCi) equals 10^{-12} Ci.

Decay product: Isotope formed by the radioactive decay of some other isotope. This newly formed isotope possesses physical and chemical properties that are different from

Site: Area(s) where a hazardous substance has been deposited, stored, disposed, or placed, or has otherwise come to be located. Such areas may include multiple sources and may include the area between sources.

Slope factor (also referred to as cancer potency factor): Estimate of the probability of response (for example, cancer) per unit intake of a substance over a lifetime. The slope factor is typically used to estimate upper-bound probability of an individual developing cancer as a result of exposure to a particular level of a human carcinogen with a weight-of-evidence classification of A, B, or C. [(mg/kg-day)$^{-1}$ for non-radioactive substances and (pC$_i$)$^{-1}$ for radioactive substances).

Source: Any area where a hazardous substance has been deposited, stored, disposed, or placed, plus those soils that have become contaminated from migration of a hazardous substance. Sources do not include those volumes of air, ground water, surface water, or surface water sediments that have become contaminated by migration, except: in the case of either a ground water plume with no identified source or contaminated surface water sediments with no identified source, the plume or contaminated sediments may be considered a source.

Target distance limit: Maximum distance over which targets for the site are evaluated. The target distance limit varies by HRS pathway.

Uranium Mill Tailings Radiation Control Act (UMTRCA) Standards: Standards for radionuclides established under sections 102, 104, and 108 of the Uranium Mill Tailings Radiation Control Act, as amended.

Vapor pressure: Pressure exerted by the vapor of a substance when it is in equilibrium with its solid or liquid form at a given temperature. For HRS purposes, use the value reported at or near 25° C. [atmosphere or torr].

Volatilization: Physical transfer process through which a substance undergoes a change of state from a solid or liquid to a gas.

Water solubility: Maximum concentration of a substance in pure water at a given temperature. For HRS purposes, use the value reported at or near 25° C. [milligrams per liter (mg/l)].

Weight-of-evidence: EPA classification system for characterizing the evidence supporting the designation of a substance as a human carcinogen. EPA weight-of-evidence groupings include:

Group A: Human carcinogen--sufficient evidence of carcinogenicity in humans.
Group B1: Probable human carcinogen--limited evidence of carcinogenicity in humans.
Group B2: Probable human carcinogen--sufficient evidence of carcinogenicity in animals.
Group C: Possible human carcinogen--limited evidence of carcinogenicity in animals.
Group D: Not classifiable as to human carcinogenicity--applicable when there is no animal evidence, or when human or animal evidence is inadequate.
Group E: Evidence of noncarcinogenicity for humans.

2.0 Evaluations Common to Multiple Pathways

2.1 *Overview.* The HRS site score (S) is the result of an evaluation of four pathways:

- Ground Water Migration (S_{gw}).
- Surface Water Migration (S_{sw}).
- Soil Exposure (S_s).
- Air Migration (S_a).

The ground water and air migration pathways use single threat evaluations, while the surface water migration and soil exposure pathways use multiple threat evaluations. Three threats are evaluated for the surface water migration pathway: drinking water, human food chain, and environmental. These threats are evaluated for two separate migration components--overland/flood migration and ground water to surface water migration. Two threats are evaluated for the soil exposure pathway: resident population and nearby population.

The HRS is structured to provide a parallel evaluation for each of these pathways and threats. This section focuses on these parallel evaluations, starting with the calculation of the HRS site score and the individual pathway scores.

2.1.1 *Calculation of HRS site score.* Scores are first calculated for the individual pathways as specified in sections 2 through 7 and then are combined for the site using the following root-mean-square equation to determine the overall HRS site score, which ranges from 0 to 100:

$$S = \sqrt{\frac{S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2}{4}}$$

2.1.2 *Calculation of pathway score.* Table 2-1, which is based on the air migration pathway, illustrates the basic parameters used to calculate a pathway score. As Table 2-1 shows, each pathway (or threat) score is the product of three "factor categories": likelihood of release, waste characteristics, and targets. (The soil exposure pathway uses likelihood of exposure rather than likelihood of release.) Each of the three factor categories contains a set of factors that are assigned numerical values and combined as specified in sections 2 through 7. The factor values are rounded to the nearest integer, except where otherwise noted.

2.1.3 *Common evaluations.* Evaluations common to all four HRS pathways include:

- Characterizing sources.
  - -Identifying sources (and, for the soil exposure pathway, areas of observed contamination [see section 5.0.1]).
  - -Identifying hazardous substances associated with each source (or area of observed contamination).
  - -Identifying hazardous substances available to a pathway.

TABLE 2-1.—SAMPLE PATHWAY SCORESHEET

Factor category	Maximum value	Value assigned
Likelihood of Release		
1. Observed Release	550	
2. Potential to Release	500	
3. Likelihood of Release (higher of lines 1 and 2)	550	
Waste Characteristics		
4. Toxicity/Mobility	(a)	
5. Hazardous Waste Quantity	(a)	
6. Waste Characteristics	100	
Targets		
7. Nearest Individual		
7a. Level I	50	
7b. Level II	45	
7c. Potential Contamination	20	
7d. Nearest Individual (higher of lines 7a, 7b, or 7c)	50	
8. Population		
8a. Level I	(b)	
8b. Level II	(b)	
8c. Potential Contamination	(b)	
8d. Total Population (lines 8a+8b+8c)	(b)	
9. Resources	5	
10. Sensitive Environments	(b)	
10a. Actual Contamination	(b)	
10b. Potential Contamination	(b)	
10c. Sensitive Environments (lines 10a+10b)	(b)	
11. Targets (lines 7d+8d+9+10c)	(b)	
12. **Pathway Score** is the product of Likelihood of Release, Waste Characteristics, and Targets, divided by 82,500. Pathway scores are limited to a maximum of 100 points.		

[a] Maximum value applies to waste characteristics category. The product of lines 4 and 5 is used in Table 2-7 to derive the value for the waste characteristics factor category.
[b] There is no limit to the human population or sensitive environments factor values. However, the pathway score based solely on sensitive environments is limited to a maximum of 60 points.

- Scoring likelihood of release (or likelihood of exposure) factor category.
  - -Scoring observed release (or observed contamination).
  - -Scoring potential to release when there is no observed release.
- Scoring waste characteristics factor category.
  - -Evaluating toxicity.
  - -Combining toxicity with mobility, persistence, and/or bioaccumulation (or ecosystem bioaccumulation) potential, as appropriate to the pathway (or threat).
  - -Evaluating hazardous waste quantity.
  - -Combining hazardous waste quantity with the other waste characteristics factors.
  - -Determining waste characteristics factor category value.
- Scoring targets factor category.
  - -Determining level of contamination for targets.

These evaluations are essentially identical for the three migration pathways (ground water, surface water, and air). However, the

REFERENCE 2

U.S. Environmental Protection Agency

National Priorities List

NPL Site Listing Process
Locate NPL Sites
NPL Site Status Information
Current NPL Updates: New Proposed and New Final NPL Sites
NPL Resources
Basic Query
Advanced Query
NPL Sites in the US
HRS Toolbox
Federal Register Notices for NPL Updates

Superfund Chemical Data Matrix (SCDM)

The Superfund Chemical Data Matrix (SCDM) is a source for factor values and benchmark values applied when evaluating potential National Priorities List (NPL) sites using the Hazard Ranking System (HRS). Factor values are part of the HRS mathematical equation for determining the relative threat posed by a hazardous waste site and reflect hazardous substance characteristics, such as toxicity and persistence in the environment, substance mobility, and potential for bioaccumulation. Benchmarks are environment- or health-based substance concentration limits developed by or used in other EPA regulatory programs. SCDM contains HRS factor values and benchmark values for hazardous substances that are frequently found at sites evaluated using the HRS, as well as the physical, chemical, and radiological data used to calculate those values. The accompanying SCDM Methodology report describes how data are selected or calculated for inclusion in SCDM and how SCDM data, HRS factor values, and benchmarks are presented in formatted printouts.

On January 28, 2004, EPA released an updated SCDM with many revisions to the HRS factor values and benchmarks. These revisions were necessary both because of updates in the SCDM procedures used to assign HRS factor values and benchmarks and because of revisions to pertinent standards and criteria for individual hazardous substances and their associated characteristics.

Superfund Chemical Data Matrix Report

- SCDM Methodology Report PDF
  - Part 1 - Table of Contents and Introduction PDF (283.3 KB, 5 pages)
  - Part 2 - Data Selection Methodology PDF (1.90 MB, 24 pages)
  - Part 3 - Calculations in SCDM PDF (1.19 MB, 28 pages)
- Appendix A - Chemical Data, Factor Values, and Benchmarks for Chemical Substances PDF
  - Part 1 - Acenaphthene to Cesium PDF (1.62 MB, 70 pages)
  - Part 2 - Cesium 137(+D) (radionuclide) to Dichloropropane, 1,2- PDF (1.66 MB, 70 pages)
  - Part 3 - Dichloropropene, 1,3- to Hexachlorodibenzofuran 1,2,3,7,8,9- PDF (1.65 MB, 70 pages)
  - Part 4 - Hexachlorodibenzofuran 2,3,4,6,7,8- to Plutonium 236 (radionuclide) PDF (1.57 MB, 70 pages)
  - Part 5 - Plutonium 238 (radionuclide) to Thorium 231 (radionuclide) PDF (1.60 MB, 70 pages)
  - Part 6 - Thorium 232 (radionuclide) to Zinc 65 (radionuclide) and Footnotes PDF (1.43 MB, 61 pages)
- Appendix BI - Hazardous Substance Factor Values PDF (155.8 KB, 15 pages)
- Appendix BII - Hazardous Substance Benchmarks PDF (413.5 KB, 32 pages)
- Appendix C - Hazardous Substance Synonyms Report PDF (72.8 KB, 3 pages)
- SCDM Interim Revised Values for Atrazine; Furfural; Nitrobenzene; Nitrosodimethylamine, N-; Perchlorate; and Trichloroethylene (TCE)
  - Atrazine Appendix A PDF (143.3KB, 5 pages)
  - Atrazine Appendices BI & BII PDF (125.6KB, 7 pages)
  - Furfural Appendix A PDF (201.2KB, 5 pages)
  - Furfural Appendices BI & BII PDF (64.8KB, 1 page)
  - Nitrobenzene Appendix A PDF (205.2KB, 5 pages)
  - Nitrobenzene Appendices BI & BII PDF (50.7KB, 1 page)
  - Nitrosodimethylamine, N- Appendix A PDF (207.1KB, 5 pages)
  - Nitrosodimethylamine, N- Appendices BI & BII PDF (137.7KB, 6 page)
  - Perchlorate Appendix A PDF (66.8KB, 5 pages)
  - Perchlorate Appendices BI & BII PDF (59KB, 7 pages)

- Trichloroethylene (TCE) Appendix A PDF (126.5KB, 2 pages)
- Trichloroethylene (TCE) Appendices BI & BII PDF (73.7KB, 1 page)

Please note that the January 2004 SCDM was developed by compiling a list of CERCLA hazardous substances used in the scoring of NPL sites since 1990. The previous SCDM versions were developed using all substances ever scored at a site using the original HRS. The January 2004 SCDM does not include any substance that has not been used in the scoring of a site since 1990, even if previously listed in SCDM.

There are 17 new entries [PDF: 41.3 KB, 1 page] (with new CAS Numbers) in the January 2004 version of SCDM that were not in the 1996 version. There are 235 fewer entries [PDF: 57.6 KB, 5 pages]. Some of these changes resulted from new naming conventions and more specific identification of isomers and congeners. Also, some substances were removed because they were pollutants and contaminants and not CERCLA hazardous substances.

NOTE: Please do not assume that any substance not listed in the January 2004 SCDM cannot be used for HRS scoring. The number of entries was reduced to save resources in developing, updating, and tracking changes in chemical properties. If values are needed for a substance that was not listed in the January 2004 SCDM and are thought to be critical to the listing decision, please request the value by calling the SCDM Helpline. As a preliminary value (for screening purposes only), the former 1996 value associated with the substance can be used, and EPA will verify the new value if necessary. For all technical questions concerning SCDM, please contact the SCDM Helpline.

For further technical SCDM information, contact:
SCDM Helpline
Available weekdays, 9:00 - 5:00 EST
Phone: (703) 461-2019
Email: SCDM@csc.com

For other SCDM information, contact:
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1200 Pennsylvania Avenue, N.W.
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Email: singer.yolanda@epa.gov

HAZARD RANKING SYSTEM
Hazardous Substance Benchmarks

Substance Name	CAS Number	Ground Water/Surface Water Pathway Drinking Water			Surface Water Pathway Food Chain			Surface Water Pathway Environmental			
								Acute		Chronic	
		MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)	FDAAL (ppm)	Ref. Dose Screen Conc (mg/kg)	Cancer Risk Screen Conc (mg/kg)	CMC (µg/L) *		CCC (µg/L) *	
								Fresh	Salt	Fresh	Salt
Acenaphthene	000083-32-9	...	2.2E+0	...	...	8.1E+1	...	...	...	...	...
Acenaphthylene	000208-96-8	...	...	...	...	...	...	...	...	...	...
Acetone	000067-64-1	...	3.3E+1*	...	...	1.2E+3*	...	...	...	...	...
Acrolein	000107-02-8	...	1.8E-2*	...	...	6.8E-1*	...	...	...	...	...
Acrylamide	000079-06-1	...	7.3E-3	1.9E-5	...	2.7E-1	7.0E-4	...	...	...	...
Alachlor**	015972-60-8	2.0E-3	3.6E-1	1.1E-3	...	1.4E+1	3.9E-2	...	...	...	...
Aldrin	000309-00-2	...	1.1E-3	5.0E-6	3.0E-1	4.1E-2	1.9E-4	3.0E+0[G]	1.3E+0[G]	...	...
Aluminum	007429-90-5	...	...	...	...	...	...	7.5E+2[G2, I2]	...	8.7E+1[G2, I2, L2]	...
Americium**	007440-35-9	...	...	...	...	...	...	...	...	...	...
Aniline	000062-53-3	...	...	1.5E-2	...	...	5.5E-1	...	...	...	...
Anthracene	000120-12-7	...	1.1E+1	...	...	4.1E+2	...	...	...	...	...
Antimony	007440-36-0	6.0E-3	1.5E-2	...	...	5.4E-1	...	...	...	...	...
Arsenic	007440-38-2	1.0E-2*	1.1E-2	5.7E-5	...	4.1E-1	2.1E-3	3.4E+2[A, D, K]	6.9E+1[A, D, bb]	1.5E+2[A, D, K]	3.6E+1[A, D, bb]
Asbestos	001332-21-4	7.0E+0 million fibers/L	...	...	...	...	...	...	...	...	...

* Indicates difference between previous version of chemical data (JUN 96) and current version of chemical data (JAN04).
** Indicates new hazardous substance in current version of chemical data (JAN04).

Substance Name	CAS Number	Ground Water/Surface Water Pathway Drinking Water			Surface Water Pathway Food Chain			Surface Water Pathway Environmental			
		MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)	FDAAL (ppm)	Ref. Dose Screen Conc (mg/kg)	Cancer Risk Screen Conc (mg/kg)	Acute CMC (µg/L) *		Chronic CCC (µg/L) *	
								Fresh	Salt	Fresh	Salt
Barium	007440-39-3	2.0E+0	2.6E+0	...	...	9.5E+1	...	...	...	...	...
Benz(a)anthracene	000056-55-3	...	...	1.2E-4	...	...	4.3E-3	...	...	...	...
Benzene	000071-43-2	5.0E-3	1.5E-1*	1.5E-3	...	5.4E+0*	5.7E-2*	...	...	...	...
Benzidine	000092-87-5	...	1.1E-1	3.7E-7	...	4.1E+0	1.4E-5	...	...	...	...
Benzo(a)pyrene	000050-32-8	2.0E-4	...	1.2E-5	...	...	4.3E-4	...	...	...	...
Benzo(g,h,i)perylene	000191-24-2	...	...	...	...	...	...	...	...	...	...
Benzo(j,k)fluorene (Fluoranthene)	000206-44-0	...	1.5E+0	...	...	5.4E+1	...	...	...	...	...
Benzo(k)fluoranthene	000207-08-9	...	...	1.2E-3	...	...	4.3E-2	...	...	...	...
Beryllium	007440-41-7	4.0E-3	7.3E-2*	...*	...	2.7E+0*	...*	...	...	...	...
Bis (2-ethylhexyl) phthalate	000117-81-7	6.0E-3	7.3E-1	6.1E-3	...	2.7E+1	2.3E-1	...	...	...	...
Boron	007440-42-8	...	3.3E+0	...	...	1.2E+2	...	...	...	...	...
Bromodichloromethane	000075-27-4	...*	7.3E-1	1.4E-3	...	2.7E+1	5.1E-2	...	...	...	...
Butylbenzyl phthalate	000085-68-7	...	7.3E+0	...	...	2.7E+2	...	...	...	...	...
Cadmium	007440-43-9	5.0E-3	1.8E-2	...	...	6.8E-1	...	2.0E+0 D, E, K, bb	4.0E+1 D, bb	2.5E-1 D, E, K, bb	8.8E+0 D, bb

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** Indicates new hazardous substance in current version of chemical data (JAN04).

Substance Name	CAS Number	Ground Water/Surface Water Pathway Drinking Water			Surface Water Pathway Food Chain			Surface Water Pathway Environmental			
		MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)	FDAAL (ppm)	Ref. Dose Screen Conc (mg/kg)	Cancer Risk Screen Conc (mg/kg)	Acute CMC (µg/L) *		Chronic CCC (µg/L) *	
								Fresh	Salt	Fresh	Salt
Carbazole	000086-74-8	...	...	4.3E-3	...	...	1.6E-1	...	...	...	...
Carbon disulfide	000075-15-0	...	3.7E+0	...	...	1.4E+2	...	...	...	...	...
Carbon tetrachloride	000056-23-5	5.0E-3	2.6E-2	6.6E-4	...	9.5E-1	2.4E-2	...	...	...	...
Cesium	007440-46-2	...	...	...	...	...	...	...	...	...	...
Chlordane	000057-74-9	2.0E-3	1.8E-2	2.4E-4	3.0E-1	6.8E-1*	9.0E-3	2.4E+0[G]	9.0E-2[G]	4.3E-3[G, aa]	4.0E-3[G, aa]
Chlordane, alpha-	005103-71-9	...	1.8E-2*	2.4E-4*	...	6.8E-1*	9.0E-3*	...	...	...	...
Chlordane, gama-	005566-34-7	...	1.8E-2*	2.4E-4*	...	6.8E-1*	9.0E-3*	...	...	...	...
Chlorobenzene	000108-90-7	1.0E-1	7.3E-1	...	...	2.7E+1	...	...	...	...	...
Chloroform	000067-66-3	...*	3.6E-1	...*	...	1.4E+1	...*	...	...	...	...
Chromium	007440-47-3	1.0E-1	1.1E-1*	...	...	4.1E+0*	...	...	...	...	...
Chromium(III)	016065-83-1	...	5.5E+1*	...	...	2.0E+3*	...	5.7E+2[D, E, K]	...	7.4E+1[D, E, K]	...
Chromium(VI)	018540-29-9	...	1.1E-1*	...	...	4.1E+0*	...	1.6E+1[D, K]	1.1E+3[D, bb]	1.1E+1[D, K]	5.0E+1[D, bb]
Chrysene	000218-01-9	...	...	1.2E-2	...	...	4.3E-1	...	...	...	...

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HAZARD RANKING SYSTEM
Hazardous Substance Benchmarks

Substance Name	CAS Number	Ground Water/Surface Water Pathway Drinking Water			Surface Water Pathway Food Chain			Surface Water Pathway Environmental			
		MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)	FDAAL (ppm)	Ref. Dose Screen Conc (mg/kg)	Cancer Risk Screen Conc (mg/kg)	Acute CMC (µg/L) *		Chronic CCC (µg/L) *	
								Fresh	Salt	Fresh	Salt
Cobalt	007440-48-4	...	...	...	...	...	...	...	...	...	...
Copper	007440-50-8	1.3E+0	...	...	...	...	...	1.3E+1 D, E, K, cc	4.8E+0 D, cc, ff	9.0E+0 D, E, K, cc	3.1E+0 D, cc, ff
Cumene	000098-82-8	...	3.7E+0*	...	...	1.4E+2*	...	...	...	...	...
Cyanamide**	000420-04-2	...	...	...	...	...	...	...	...	...	...
Cyanide	000057-12-5	2.0E-1	7.3E-1	...	...	2.7E+1	...	2.2E+1 K, Q	1.0E+0 Q, bb	5.2E+0 K, Q	1.0E+0 Q, bb
DDD	000072-54-8	...	...	3.5E-4	...*	...	1.3E-2	...	...	...	...
DDE	000072-55-9	...	...	2.5E-4	5.0E+0	...	9.3E-3	...	...	...	...
DDT	000050-29-3	...	1.8E-2	2.5E-4	5.0E+0	6.8E-1	9.3E-3	1.1E+0 G, ii	1.3E-1 G, ii	1.0E-3 G, aa, ii	1.0E-3 G, aa, ii
Di-n-butyl phthalate	000084-74-2	...	3.7E+0	...	...	1.4E+2	...	...	...	...	...
Di-n-octyl phthalate	000117-84-0	...	7.3E-1	...	...	2.7E+1	...	...	...	...	...
Dibenz(a,h)anthracene	000053-70-3	...	...	1.2E-5	...	...	4.3E-4	...	...	...	...
Dibenzofuran	000132-64-9	...	1.5E-1*	...	...	5.4E+0*	...	...	...	...	...
Dibromo-3-chloropropane, 1,2-	000096-12-8	2.0E-4	...	6.1E-5	...	...	2.3E-3	...	...	...	...
Dibromoethane, 1,2-	000106-93-4	...*	...	1.0E-6	...	...	3.7E-5	...	...	...	...

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HAZARD RANKING SYSTEM
Hazardous Substance Benchmarks

Substance Name	CAS Number	Ground Water/Surface Water Pathway Drinking Water			Surface Water Pathway Food Chain			Surface Water Pathway Environmental			
		MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)	FDAAL (ppm)	Ref. Dose Screen Conc (mg/kg)	Cancer Risk Screen Conc (mg/kg)	Acute CMC (µg/L) *		Chronic CCC (µg/L) *	
								Fresh	Salt	Fresh	Salt
Dichlorobenzene, 1,4-	000106-46-7	7.5E-2	...	3.5E-3	...	...	1.3E-1	...	...	...	...
Dichloroethane, 1,1-	000075-34-3	...	3.7E+0	...	...	1.4E+2	...	...	...	...	...
Dichloroethane, 1,2-	000107-06-2	5.0E-3	...	9.4E-4	...	...	3.5E-2	...	...	...	...
Dichloroethylene, 1,1-	000075-35-4	7.0E-3	1.8E+0*	...*	...	6.8E+1*	...*	...	...	...	...
Dichloroethylene, 1,2-**	000540-59-0	...	3.3E-1	...	...	1.2E+1	...	...	...	...	...
Dichloroethylene, cis-1,2-	000156-59-2	7.0E-2	3.6E-1	...	...	1.4E+1	...	...	...	...	...
Dichloroethylene, trans-1,2-	000156-60-5	1.0E-1	7.3E-1	...	...	2.7E+1	...	...	...	...	...
Dichlorophenol, 2,4-	000120-83-2	...	1.1E-1	...	...	4.1E+0	...	...	...	...	...
Dichloropropane, 1,2-	000078-87-5	5.0E-3	...	1.3E-3	...	...	4.6E-2	...	...	...	...
Dichloropropene, 1,3-	000542-75-6	...	1.1E+0*	8.5E-4	...	4.1E+1*	3.2E-2	...	...	...	...
Dieldrin	000060-57-1	...	1.8E-3	5.3E-6	3.0E-1	6.8E-2	2.0E-4	2.4E-1[K]	7.1E-1[G]	5.6E-2[K, O]	1.9E-3[G, aa]
Diethyl phthalate	000084-66-2	...	2.9E+1	...	...	1.1E+3	...	...	...	...	...
Dimethyl phenol, 2,4-	000105-67-9	...	7.3E-1	...	...	2.7E+1	...	...	...	...	...

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Substance Name	CAS Number	Ground Water/Surface Water Pathway Drinking Water			Surface Water Pathway Food Chain			Surface Water Pathway Environmental			
		MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)	FDAAL (ppm)	Ref. Dose Screen Conc (mg/kg)	Cancer Risk Screen Conc (mg/kg)	Acute CMC (µg/L) *		Chronic CCC (µg/L) *	
								Fresh	Salt	Fresh	Salt
Dinitrobenzene, 1,3-	000099-65-0	...	3.7E-3	...	...	1.4E-1	...	...	...	...	...
Dioxin 1,4-**	000290-67-5	...	...	...	...	...	...	...	...	...	...
Diphenylhydrazine, 1,2-	000122-66-7	...	...	1.1E-4	...	...	3.9E-3	...	...	...	...
Disulfoton	000298-04-4	...	1.5E-3	...	...	5.4E-2	...	...	...	...	...
Endosulfan (I or II)	000115-29-7	...	2.2E-1	...	...	8.1E+0	...	...	...	...	...
Endosulfan I**	000959-98-8	...	2.2E-1	...	...	8.1E+0	...	2.2E-1[G, Y]	3.4E-2[G, Y]	5.6E-2[G, Y]	8.7E-3[G, Y]
Endosulfan II**	033213-65-9	...	2.2E-1	...	...	8.1E+0	...	2.2E-1[G, Y]	3.4E-2[G, Y]	5.6E-2[G, Y]	8.7E-3[G, Y]
Endrin	000072-20-8	2.0E-3	1.1E-2	...	...	4.1E-1	...	8.6E-2[K]	3.7E-2[G]	3.6E-2[K, O]	2.3E-3[G, aa]
Endrin aldehyde	007421-93-4	...	...	...	...	...	...	...	...	...	...
Ethyl benzene	000100-41-4	7.0E-1	3.7E+0	...	...	1.4E+2	...	...	...	...	...
Ethyl chloride	000075-00-3	...	...	...	...	...	...	...	...	...	...
Ethylene glycol monobutyl ether (EBGE)**	000111-76-2	...	1.8E+1	...	...	6.8E+2	...	...	...	...	...
Fluorene	000086-73-7	...	1.5E+0	...	...	5.4E+1	...	...	...	...	...
Fluorine	007782-41-4	...	2.2E+0	...	...	8.1E+1	...	...	...	...	...

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Substance Name	CAS Number	Ground Water/Surface Water Pathway Drinking Water			Surface Water Pathway Food Chain			Surface Water Pathway Environmental			
		MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)	FDAAL (ppm)	Ref. Dose Screen Conc (mg/kg)	Cancer Risk Screen Conc (mg/kg)	Acute CMC (µg/L) *		Chronic CCC (µg/L) *	
								Fresh	Salt	Fresh	Salt
Heptachlor	000076-44-8	4.0E-4	1.8E-2	1.9E-5	3.0E-1	6.8E-1	7.0E-4	5.2E-1 G	5.3E-2 G	3.8E-3 G, aa	3.6E-3 G, aa
Heptachlor epoxide, alpha, beta, gamma	001024-57-3	2.0E-4	4.7E-4	9.4E-6	3.0E-1	1.8E-2	3.5E-4	5.2E-1 G, V	5.3E-2 G, V	3.8E-3 G, V, aa	3.6E-3 G, V, aa
Heptachlorodibenzo-p-dioxin**	037871-00-4	...	...	...	...	...	...	...	...	...	...
Heptachlorodibenzo-p-dioxin 1,2,3,4,6,7,8-	035822-46-9	...	...	5.7E-7	...	...	2.1E-5	...	...	...	...
Heptachlorodibenzofuran 1,2,3,4,6,7,8-	067562-39-4	...	...	5.7E-7	...	...	2.1E-5	...	...	...	...
Heptachlorodibenzofuran 1,2,3,4,7,8,9-	055673-89-7	...	...	5.7E-7*	...	...	2.1E-5*	...	...	...	...
Hexabromobiphenyl (PBB)**	036355-01-8	...	...	...	...	...	...	...	...	...	...
Hexachlorobenzene	000118-74-1	1.0E-3	2.9E-2	5.3E-5	...	1.1E+0	2.0E-3	...	...	...	...
Hexachlorobutadiene	000087-68-3	...	7.3E-3	1.1E-3	...	2.7E-1	4.0E-2	...	...	...	...
Hexachlorocyclohexane, alpha-	000319-84-6	...	...	1.4E-5	...	...	5.0E-4	...	...	...	...
Hexachlorocyclohexane, beta-	000319-85-7	...	...	4.7E-5	...	...	1.8E-3	...	...	...	...
Hexachlorodibenzo-p-dioxin 1,2,3,4,7,8-	039227-28-6	...	...	1.4E-8	...	...	5.3E-7	...	...	...	...
Hexachlorodibenzo-p-dioxin 1,2,3,6,7,8-	057653-85-7	...	...	1.4E-8	...	...	5.3E-7	...	...	...	...
Hexachlorodibenzo-p-dioxin 1,2,3,7,8,9-	019408-74-3	...	...	1.4E-8	...	...	5.1E-7	...	...	...	...

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Substance Name	CAS Number	Ground Water/Surface Water Pathway Drinking Water			Surface Water Pathway Food Chain			Surface Water Pathway Environmental			
								Acute CMC (µg/L) *		Chronic CCC (µg/L) *	
		MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)	FDAAL (ppm)	Ref. Dose Screen Conc (mg/kg)	Cancer Risk Screen Conc (mg/kg)	Fresh	Salt	Fresh	Salt
Hexachlorodibenzofuran 1,2,3,4,7,8-	070648-26-9	...	...	5.7E-8	...	...	2.1E-6	...	...	...	...
Hexachlorodibenzofuran 1,2,3,6,7,8-	057117-44-9	...	...	5.7E-8	...	...	2.1E-6	...	...	...	...
Hexachlorodibenzofuran 1,2,3,7,8,9-	072918-21-9	...	...	5.7E-8	...	...	2.1E-6	...	...	...	...
Hexachlorodibenzofuran 2,3,4,6,7,8-	060851-34-5	...	...	5.7E-8	...	...	2.1E-6	...	...	...	...
Hydrazine	000302-01-2	...	...	2.8E-5	...	...	1.1E-3	...	...	...	...
Hydrogen sulfide	007783-06-4	...	1.1E+0*	...	...	4.1E+1*	...	...	...	2.0E+0[F2]	2.0E+0[F2]
Indeno(1,2,3-cd)pyrene	000193-39-5	...	...	1.2E-4	...	...	4.3E-3	...	...	...	...
Iron	007439-89-6	...	...	...	...	...	...	...	...	1.0E+3[F2]	...
Lead	007439-92-1	1.5E-2	...	...	...	...	...	6.5E+1[D, E, bb, gg]	2.1E+2[D, bb]	2.5E+0[D, E, bb, gg]	8.1E+0[D, bb]
Lead chromate**	007758-97-6	...	...	...	...	...	...	...	...	...	...
Lindane	000058-89-9	2.0E-4	1.1E-2	6.6E-5	...	4.1E-1	2.4E-3	9.5E-1[K]	1.6E-1[G]	...	...
Manganese	007439-96-5	...	5.1E+0	...	...	1.9E+2	...	...	...	...	...
Mercury	007439-97-6	2.0E-3	1.1E-2	...	1.0E+0	4.1E-1	...	1.4E+0[D, K, hh]	1.8E+0[D, ee, hh]	7.7E-1[D, K, hh]	9.4E-1[D, ee, hh]

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** Indicates new hazardous substance in current version of chemical data (JAN04).

Substance Name	CAS Number	Ground Water/Surface Water Pathway Drinking Water			Surface Water Pathway Food Chain			Surface Water Pathway Environmental			
		MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)	FDAAL (ppm)	Ref. Dose Screen Conc (mg/kg)	Cancer Risk Screen Conc (mg/kg)	Acute CMC (µg/L) *		Chronic CCC (µg/L) *	
								Fresh	Salt	Fresh	Salt
Methoxychlor	000072-43-5	4.0E-2	1.8E-1	...	...	6.8E+0	...	...	...	3.0E-2[F2]	3.0E-2[F2]
Methyl Parathion	000298-00-0	...	9.1E-3	...	...	3.4E-1	...	...	...	...	...
Methyl ethyl ketone	000078-93-3	...	2.2E+1	...	...	8.1E+2	...	...	...	...	...
Methyl isobutyl ketone	000108-10-1	...	2.9E+0	...	...	1.1E+2	...	...	...	...	...
Methyl phenol, 4-	000106-44-5	...	1.8E-1	...	...	6.8E+0	...	...	...	...	...
Methyl tert-butyl ether (MTBE)**	001634-04-4	...	...	...	...	...	...	...	...	...	...
Methylene chloride (dichloromethane)	000075-09-2	5.0E-3	2.2E+0	1.1E-2	...	8.1E+1	4.2E-1	...	...	...	...
Methylnaphthalene, 2-	000091-57-6	...	...	...	...	...	...	...	...	...	...
Naphthalene	000091-20-3	...	1.5E+0	...	...	5.4E+1	...	...	...	...	...
Nickel	007440-02-0	...	7.3E-1	...	...	2.7E+1	...	4.7E+2[D, E, K]	7.4E+1[D, bb]	5.2E+1[D, E, K]	8.2E+0[D, bb]
Nitrosodiphenylamine, N-	000086-30-6	...	...	1.7E-2	...	...	6.4E-1	...	...	...	...
Pentachlorodibenzo-p-dioxin 1,2,3,7,8-	040321-76-4	...	...	1.1E-9	...	...	4.2E-8	...	...	...	...
Pentachlorodibenzofuran 1,2,3,7,8-	057117-41-6	...	...	...*	...	...	...*	...	...	...	...
Pentachlorodibenzofuran 2,3,4,7,8-**	057117-31-4	...	...	5.7E-9	...	...	2.1E-7	...	...	...	...

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Substance Name	CAS Number	Ground Water/Surface Water Pathway Drinking Water			Surface Water Pathway Food Chain			Surface Water Pathway Environmental			
								Acute		Chronic	
		MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)	FDAAL (ppm)	Ref. Dose Screen Conc (mg/kg)	Cancer Risk Screen Conc (mg/kg)	CMC (µg/L) *		CCC (µg/L) *	
								Fresh	Salt	Fresh	Salt
Pentachlorophenol (PCP)	000087-86-5	1.0E-3	1.1E+0	7.1E-4	...	4.1E+1	2.6E-2	1.9E+1[F, K]	1.3E+1[bb]	1.5E+1[F, K]	7.9E+0[bb]
Perchlorate**	014797-73-0	...	3.7E-3	...	...	1.4E-1	...	...	...	...	...
Phenanthrene	000085-01-8	...	...	...	...	...	...	...	...	...	...
Phenol	000108-95-2	...	1.1E+1*	...	...	4.1E+2*	...	...	...	...	...
Plutonium	007440-07-5	...	...	...	...	...	...	...	...	...	...
Polychlorinated biphenyls (PCBs)	001336-36-3	5.0E-4	7.3E-4	4.3E-5	...	2.7E-2	1.6E-3	...	...	1.4E-2[N, aa]	3.0E-2[N, aa]
Pyrene	000129-00-0	...	1.1E+0	...	...	4.1E+1	...	...	...	...	...
Radium	007440-14-4	...	...	...	...	...	...	...	...	...	...
Radon	010043-92-2	...	...	...	...	...	...	...	...	...	...
Selenium	007782-49-2	5.0E-2	1.8E-1	...	...	6.8E+0	...	...[L, R, T]	2.9E+2[D, bb, dd]	5.0E+0[T]	7.1E+1[D, bb, dd]
Silver	007440-22-4	...	1.8E-1	...	...	6.8E+0	...	3.2E+0[D, E, G]	1.9E+0[D, G]	...	...
Strontium	*007440-24-6*	...	...	...	...	...	...	...	...	...	...
Styrene	000100-42-5	1.0E-1	7.3E+0	...	...	2.7E+2	...	...	...	...	...

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Substance Name	CAS Number	Ground Water/Surface Water Pathway Drinking Water			Surface Water Pathway Food Chain			Surface Water Pathway Environmental			
		MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)	FDAAL (ppm)	Ref. Dose Screen Conc (mg/kg)	Cancer Risk Screen Conc (mg/kg)	Acute CMC (µg/L) *		Chronic CCC (µg/L) *	
								Fresh	Salt	Fresh	Salt
Trichlorophenol, 2,4,6-	000088-06-2	...	...	7.7E-3	...	...	2.9E-1	...	...	...	...
Trichloropropane, 1,2,3-	000096-18-4	...	2.2E-1	1.2E-5	...	8.1E+0	4.5E-4	...	...	...	...
Trifluralin (Treflan)	001582-09-8	...	2.7E-1	1.1E-2	...	1.0E+1	4.1E-1	...	...	...	...
Trinitrobenzene, 1,3,5-	000099-35-4	...	1.1E+0*	...	...	4.1E+1*	...	...	...	...	...
Vanadium	007440-62-2	...	2.6E-1	...	...	9.5E+0	...	...	...	...	...
Vinyl acetate	000108-05-4	...	3.7E+1	...	...	1.4E+3	...	...	...	...	...
Vinyl chloride	000075-01-4	2.0E-3	1.1E-1*	5.7E-5	...	4.1E+0*	2.1E-3	...	...	...	...
Xylene**	001330-20-7	...	7.3E+0	...	...	2.7E+2	...	...	...	...	...
Xylene, m-	000108-38-3	1.0E+1	7.3E+1	...	...	2.7E+3	...	...	...	...	...
Xylene, o-	000095-47-6	1.0E+1	7.3E+1	...	...	2.7E+3	...	...	...	...	...
Xylene, p-	000106-42-3	1.0E+1	...	...	...	...	...	...	...	...	...
Zinc	007440-66-6	...	1.1E+1	...	...	4.1E+2	...	1.2E+2[D, E, K]	9.0E+1[D, bb]	1.2E+2[D, E, K]	8.1E+1[D, bb]

* Indicates difference between previous version of chemical data (JUN 96) and current version of chemical data (JAN04).
** Indicates new hazardous substance in current version of chemical data (JAN04).

HAZARD RANKING SYSTEM
Hazardous Substance Benchmarks

Substance Name	CAS Number	Ground Water/Surface Water Pathway Drinking Water			Surface Water Pathway Food Chain			Surface Water Pathway Environmental			
		MCL/MCLG (mg/L)	Reference Dose Screen Conc (mg/L)	Cancer Risk Screen Conc (mg/L)	FDAAL (ppm)	Ref. Dose Screen Conc (mg/kg)	Cancer Risk Screen Conc (mg/kg)	Acute CMC (µg/L) *		Chronic CCC (µg/L) *	
								Fresh	Salt	Fresh	Salt
Tetrachlorobenzene, 1,2,4,5-	000095-94-3	...	1.1E-2	...	...	4.1E-1	...	...	...	...	...
Tetrachlorodibenzo-p-dioxin**	041903-57-5	...	...	...	...	...	...	...	...	...	...
Tetrachlorodibenzo-p-dioxin 2,3,7,8- (TCDD)	001746-01-6	3.0E-8	...	5.7E-10	...	...	2.1E-8	...	...	...	...
Tetrachlorodibenzofuran 2,3,7,8-	051207-31-9	...	...	5.7E-9	...	...	2.1E-7	...	...	...	...
Tetrachloroethane, 1,1,2,2-	000079-34-5	...	...	4.3E-4	...	...	1.6E-2	...	...	...	...
Tetrachloroethylene	000127-18-4	5.0E-3	3.6E-1	1.6E-3	...	1.4E+1	6.1E-2	...	...	...	...
Thallium	007440-28-0	5.0E-4	...	...	...	...	...	...	...	...	...
Toluene	000108-88-3	1.0E+0	7.3E+0	...	...	2.7E+2	...	...	...	...	...
Toxaphene	008001-35-2	3.0E-3	...	7.7E-5	...	...	2.9E-3	7.3E-1	2.1E-1	2.0E-4[aa]	2.0E-4[aa]
Trichlorobenzene, 1,2,4-	000120-82-1	7.0E-2	3.6E-1	...	...	1.4E+1	...	...	...	...	...
Trichloroethane, 1,1,1-	000071-55-6	2.0E-1	...	...	...	...	...	...	...	...	...
Trichloroethane, 1,1,2-	000079-00-5	3.0E-3	1.5E-1	1.5E-3	...	5.4E+0	5.5E-2	...	...	...	...
Trichloroethylene (TCE)	000079-01-6	5.0E-3	...	7.7E-3	...	...	2.9E-1	...	...	...	...
Trichlorofluoromethane	000075-69-4	...	1.1E+1	...	...	4.1E+2	...	...	...	...	...

* Indicates difference between previous version of chemical data (JUN 96) and current version of chemical data (JAN04).
** Indicates new hazardous substance in current version of chemical data (JAN04).

REFERENCE 3

Kek -

PRELIMINARY ASSESSMENT

FEBCO MINE

New Mexico Environment Department

Prepared by Linda Fluk

May 22, 1991

Site Description

Febco Mine, also referred to as Small Stake Mine, is an abandoned uranium mine located approximately 11 miles northeast of Prewitt, McKinley County, New Mexico (Figure 1 and 2). It is located in the Grants Mineral Belt which contains almost half of the United States uranium reserve (US EPA, 1975, p. 1). The mine site may be reached by travelling east on U.S. 66 for 2.7 miles from the Prewitt Post Office. Turn north on an unimproved dirt road under the railroad tracks and travel northeast for approximately 9 miles to an east-west trending fence. This fence is believed to separate Indian Allotment land from State or private land. The mine site is approximately two-tenths of a mile north of the fence on private property. Section 31, Township 14N, Range 10W (in which Febco Mine is located) was granted to the Santa Fe Railroad from the U.S. Government. The grant, including the mineral rights was then sold to W.A. Berryhill in 1946, and was then leased to Duane Berryhill and L. Elkins in 1952 (Appendix A). Topographic maps of the area of the site are Goat Mountain, NM (1980), Thoreau NE, NM (1980), Ambrosia Lake, NM (1980), and Bluewater, NM (1980). The site is located in Township 14N Range 10W Section 31 S1/2, SW1/4, longitude 107°56'10", latitude 35°23'40".

The site was brought to the attention of New Mexico Environment Department (NMED) by Navajo Superfund. The mine site, which is located on private property, has potential impacts on the Navajo community which is located in the drainage area downstream from the site. The purpose of the Preliminary Assessment is to investigate the hazards of transport of radioactive materials via wind and surface water.

Background/Operating History

Febco Mine is located in the Grants-Ambrosia Lake district of the Grants Mineral Belt. Febco Mines, Inc. began operations at the mine in 1952. The total period of operation is not known. However, production at the mine from 1952 through July 1, 1958 was 3,912 tons of ore averaging 0.27% U_3O_8 (Anderson 1980, p.

183). Three adits (horizontal passages from the mine surfaces) were observed during the reconnaissance visit (Figure 3). However, records indicate that 4 adits comprise the workings at the site (ibid.). The westernmost adit is the largest of the three observed adits, with a 5 foot by 4 foot portal (Appendix B, Photo 1). The second largest adit is located approximately 4/10 of a mile to the east via a dirt road. It is approximately 5 feet by 2 feet with a tailings pile which is approximately 70 feet high and fans out to approximately 100 feet wide at the toe (Appendix B, Photos 2 and 3). The third adit is located approximately 190 feet east of the middle adit and is about 2 feet by 2 feet. The tailings pile is approximately 50 feet high and fans out to about 70 feet at the toe (Appendix C).

Mining method is believed to be open stope with random pillars using rackless haulage (Appendix A). Overburden and low-grade ore were dumped over the side of the outcrop as can be seen in Photo 3 of Appendix B.

Scintillometer readings of gamma radiation were taken during the reconnaissance visit. Ambient air readings were taken at different locations: approximately 9 miles southeast of the mine, 200 feet south of the mine tailings, 100 to 200 feet "up-wind" of the mine tailings at the Dakota Sandstone outcrop, 1,000 to 2,000 feet southwest of the 3 adits, at a drainage from the westernmost adit, and 100 to 200 feet northeast of the westernmost adit at the Dakota Sandstone outcrop (Figure 3). These readings were 8 u-roentgen/hour, 13.5 u-roentgen/hour, 30 u-roentgen/hour, 10 u-roentgen/hour, 30 u-roentgen/hour, and 13.5 u-roentgen/hour respectively (Figure 3). The background reading is considered to range between 13.5 u-roentgen/hour and 30 u-roentgen/hour, which are the readings taken at the Dakota Sandstone (the formation in which the mine is located). The readings observed on the larger tailings pile ranged between 100 to 900 u-roentgen/hour (Appendix B, Photo 4). And readings taken at the opening of the adits ranged between 90 u-roentgen/hour and 150 u-roentgen/hour. The scintillometer readings at the tailings pile and the adits are clearly above background readings.

Waste Characteristics

Febco Mine consists of two tailings piles which are uncapped and unstabilized. No run-on diversion structures are present and the piles are unlined. The two piles contain an estimated combined 5,037 cubic yards of tailings (Appendix D). The tailings are red-black in color, unconsolidated and have the consistency of fine sand (Appendix B, Photo 4).

The hazardous constituents of most concern at the site are radionuclides. Radionuclides extracted from uranium ore are ^{235}U and ^{238}U, with 99.28% present as ^{238}U. Radiation contamination

from uranium mines arise not so much from the uranium itself, but rather from the radionuclides generated by its decay (US EPA, 1978, p. 4A-1). The ^{238}U series includes 13 principal radionuclides terminating with the stable ^{206}Pb (Figure 4).

Based on recommendations made by the International Commission of Radiological Protection (ICRP) and National Council on Radiation Protection (NCRP), the United States has set standards that limit the exposure of radiation workers and general public to ionizing radiation (Kelly, D., 1983, p. 64). Maximum permissible dose (MPD), the accumulated dose of radiation that should not produce significant somatic or genetic damage over an individual's lifetime, for individuals in the general public is 0.5 rems per year (ibid., p. 65). This is approximately equivalent to 5,000 u-roentgen/year for gamma radiation[1]. On-site tailings piles show scintillometer readings of 100 to 900 u-roentgen/hour of gamma radiation. Background gamma radiation at the site, using a Scintillometer, is between 13.5 and 30 u-roentgen/hour.

Geology

The Grants Mineral Belt is located in the San Juan Basin in the Colorado Plateau physiographic province. Primary structural geologic features are the Chaco Slope, Zuni Uplift, and Acoma Sag (Figure 5). Cretaceous and Tertiary rocks outcrop along the Chaco Slope. Mesozoic and Upper Paleozoic sediment and Precambrian igneous and metamorphic rocks are exposed in the Zuni Uplift (NMEID, 1986, p. 9). Febco Mine is located on the Chaco Slope. The strata here dip to the northeast toward the San Juan Basin axis (Figure 6).

Uranium deposits in the Mineral Belt are found only in the Jurassic and Cretaceous age rocks which extend to a total depth of 1,000 to 1,500 feet (Kelley, 1963, p. 6). Febco Mine is exposed in the Early Cretaceous Dakota Sandstone (Figures 7a and 7b). In the site area, the Dakota Sandstone Formation is approximately 75 to 100 feet thick. It consists mostly of tan to gray quartz sandstone, dark gray carbonaceous shale, and local lenses of conglomerate and impure coal (Kelley, 1963, p. 17) (Appendix B, Photos 1 and 2). The mine is located in the coaly carbonaceous shale zone (Anderson, 1980, p. 183).

Other geologic units of interest which serve as aquifers and underlie the Morrison Formation and Dakota Sandstone are the Jurassic Entrada Sandstone of the San Rafael Group and the Triassic Sonsela Sandstone Member of the Chinle Formation (Appendix E).

[1]For gamma radiation, 1 rem is equal to 1 roentgen.

Climate

The climate in the site area is arid to semi-arid. Annual precipitation is 20 to 30 inches in the mountain areas where the site is located. The majority of precipitation occurs in the summer as brief, intense thunderstorms (NMEID, 1986, p. 9). Small water surpluses occur in winter (November through March), and large water deficits occur during the remainder of the year. The deficit is greatest during the warm growing season months of June through September (ibid.). The net precipitation for the area of Zuni, which is located approximately 30 miles from the site, is 2.74 inches for the period November through March (Tuan, 1973, Figure 53).

Prevailing wind direction in the Grants area is from the west, and the winds of the highest velocity are generally from the west-southwest (USDA, 1967, p. 6). The winds were predominately from the west during the reconnaissance visit (Appendix C).

Ground Water Pathway

Regional and Site Specific Ground Water Setting:

Ground water is the principal source of water supply for drinking and irrigation in the site area (US EPA, 1975, p. 3). Ground water development in the site area is from four units: the Upper Triassic Sonsela Sandstone Member of the Chinle Formation, the Jurassic Entrada Sandstone Formation, the Jurassic Westwater Canyon Sandstone of the Morrison Formation, and the Cretaceous Dakota Sandstone.

The Sonsela Sandstone Member of the Chinle Formation yields small amounts of water to domestic and stock wells in Grants area (Kelley, 1963, p. 20). The Entrada Sandstone is a medium to fine grained sandstone which yields water only where recharged by overlying water-bearing formations (Appendix E). The Westwater Canyon Sandstone, which consists of poorly sorted arkosic sandstone, yields significant supplies of water in the surrounding site area (Kelley, 1963, p. 220). The hydrologic properties of the sandstone vary widely in short distances (ibid.). The Dakota Sandstone is composed of fine to coarse grained sandstone and carbonaceous shale. It is not widely used in the surrounding area (ibid., p. 221).

The ground water flow direction in the vicinity of the site is believed to follow the regional slope, which is to the northeast.

The aquifer of concern in the site area is the Sonsela Sandstone Member of the Chinle Formation which serves the Navajo Nation Water Resources Division well #16T-551 (Figure 8). Depth to

water in this well is reported to be 1000 feet (Morris, 1990, p. 3). An analysis of this well water in 1989 indicated heavy metal concentrations were below drinking water standards and for some elements above detection limits. The gross alpha concentration detected in the water was 12.3 $\pm$ 5.99 pci/L. Taking error into consideration, the gross alpha concentration may exceed the Federal maximum contaminant level of 15 pci/L (Appendix F).

The Entrada Sandstone is the aquifer source of well #16T-521 (Figure 8) which supplies stock water and possibly domestic use. Depth to water in this well is 100 feet (ibid.). Another stock well is shown in Figure 8, however no information on this well is presently available. No heavy metal or radionuclide analyses records are available for the stock wells.

Targets:

Ground water drawn from the aquifers of concern is used for drinking water, stock water, and irrigation. There are three active wells within 4 miles of the site as mentioned above. The municipal water system well #16T-551 is located approximately 3.5 miles from the site and draws water from about 1,000 foot depth. It is currently operated by the Navajo tribe and serves approximately 500 persons in the Haystack Community (Morris, 1990, p. 3). The stock well #16T-521 is located approximately 2.5 miles from the site, and draws water from about 100 foot depth. Another stockwater well is located 1.5 miles from the site, and depth to water is unknown. Figure 8 shows the locations of these wells and the residences who are supplied by well #16T-551 via a distribution system. It is believed that area residents may also utilize the stock well #16T-521 for domestic purposes (ibid.).

Due to the fact that the waste quantity is not large, the contaminants of concern (heavy metals and radionuclides) are not very mobile in water, and the distance to the nearest well is approximately 1.5 miles away, the potential ground water threat is not believed to be high.

Surface Water Pathway

Regional and Site Specific Surface Water Setting:

Febco Mine is located at an elevation of 7,200 feet near the headwater of an east-west trending drainage (Appendix A, Photo 5). The drainage continues south of the mine (Figure 8). Two stock wells, and one public supply well, #16T-551, which is the Navajo Nation Water Resources Division well and supplies most of the Haystack community, are located in the drainage area downstream from the mine.

There are no known drinking water intakes within 15 miles downstream from the site. The surface water areas, however, are used for irrigation and recreation purposes. The drainage area is used for grazing cattle and goat, as observed during the site visit.

One Federally designated sensitive environment lies within 4 miles of the site (Morris, 1990, p. 4). The sensitive environment is habitat known to be used by Federally designated or proposed endangered or threatened species. Listed potential-threatened-endangered fauna and flora species have been reported in the Haystack Mountain area which is within 4 miles of the site. These species are the following: Endangered Black Footed Ferrit (Mustela nigripes), Burrowing Owl (Athene cunicularia), Mexican Free-tailed Bat (Tadarida brasiliensis), Mexican Spotted Owl (Strix occidentalis), Goshawk, Sharpshinned Hawk, and Rhizome Fleabane (Erigeron rhizomatus) (ibid.).

Targets:

There are no drinking water threat targets at the site since there are no drinking water intakes within 15 miles of the site. However, the surface water, when water is present, is assumed to be used for watering of livestock. The grazing animals also ingest the flora in the drainage area which could lead to bioaccumulation of contaminants in the animals and threats to the foodchain.

AIR PATHWAY

Regional and Site Specific Air Setting:

Prevailing wind direction in the Grants area is from the west and the winds of the highest velocity are generally from the west-southwest (USDA, 1967, p. 6). The potential for airborne migration of radon gas and particulates from the waste piles is high due to the high winds which blow in the springtime and to the fine grained nature of the waste.

Targets:

The Haystack Community is within 4 miles south of Febco Mine. The nearest person lives approximately 3/4 miles from the mine and approximately 500 persons live within 4 miles of the mine (Figure 8). The residences are not directly downwind (east-northeast) from the mine, however the wind does change direction (as observed during the site visit) and most probably blows toward the south.

ON-SITE PATHWAY

On-Site Setting:

Febco Mine is an abandoned mine consisting of 2 tailings piles and 3 adits (possibly more) which are easily accessible to the public. There are no barriers or danger signs restricting access to the site. The waste in the tailings piles become windswept and pose serious threats when inhaled or ingested. Two on-site adits are inclined with vertical timbered shafts which pose significant dangers to persons wanting to explore the shafts. Animals were observed grazing in the immediate area and travelling on top of the tailings piles (Appendix B, Photo 3).

Targets:

There are no people occupying residences, working, or attending school or day care, or no sensitive environments on or within 200 feet or 1/2 mile of the site. However, residents in the Haystack Community are exposed to elevated radon levels and windswept tailings from on-site. Residents are also exposed indirectly via a threat to the foodchain by animals grazing on-site.

Two observations made during the site visit indicate the tailings have not been heavily distributed, or concentrated, away from the piles; there was no evidence of tailings blanketing the area surrounding the piles, and scintillometer readings of gamma radiation off the piles did not show elevated levels of radiation.

OTHER REGULATORY INVOLVEMENT

Permits: No known permits for Febco Mine.

State Agencies: No known involvement by State agencies.

Other Federal Programs: No known involvement by other Federal programs.

Removal Considerations: No known removal activities.

CONCLUSIONS AND RECOMMENDATIONS

Febco Mine is an abandoned uranium mine which was active in the 1950's. The site today consists of 3 (or possibly more) adits and 2 tailings piles. The combined volume of waste in these piles is approximately 5,037 cubic yards. The tailing piles, which consist of fine grained unconsolidated material, are uncapped and unlined, and access on-site is unrestricted. Scintillometer readings of gamma radiation were 100 to 900 u-

roentgen/hour on the tailings piles, 90 to 150 u-roentgen/hour at the openings of the adits, and 13.5 to 30 u-roentgen/hour upwind of the mine at the outcrop of the Dakota Sandstone (background).

Ground water threat due to recharge from the tailings piles is low due to the fact that there is a great depth to water at the site, the hazardous constituents of concern are not very mobile in water, and the nearest well (a stockwater well) is approximately 1.5 miles away. Surface water threat due to physical transport and adsorption of heavy metals and radionuclides by the sedimentary material is high because the tailings piles lie in the drainage area and are subject to surface water runoff. However the drinking water threat is low because there are no drinking water intakes within 15 miles of the site. The pathway of greatest concern at Febco Mine is the air pathway. The fine grained tailings become windswept during high winds and could potentially impact the residents which live south of the site (however the predominant wind direction is to the east-northeast). Also the on-site pathway is of concern as access on-site is not restricted and the area may be used for recreation purposes. Grazing animals on-site pose a problem as they may bioaccumulate contaminants and impact the foodchain.

APPENDIX E

FEBCO MINE

STRATOGRAPHIC COMUMN OF

AMBROSIA LAKE AREA

TABLE 1. STRATIGRAPHIC COLUMN OF AMBROSIA LAKE AREA.

AGE			FORMATION	THICKNESS (in feet)	DISTRIBUTION	LITHOLOGY	WATER BEARING PROPERTIES
CENOZOIC	QUATERNARY		Alluvium	0-150	Occurs in major valleys and along stream courses.	Generally clay and silt, with minor gravel.	Yields small quantities of water near recharge zones.
	TERTIARY	NEOGENE	Basalts	0-550	As flows at the Cebolleta Mountains to the east of Ambrosia Lake and around El Tintero Peak to the south.	Basalt and andesite flows with interbedded alluvium; some dikes and cinder cones.	Generally poor horizontal permeability, better vertical permeability. A few springs are found at the base of basalt cliffs.
		EOCENE	*San Jose-Wasatch Formation	200-2000	Extensively exposed in central basin area, Rio Arriba County.	Variegated sandstone, shale and conglomerate.	Sandstone beds yield small to moderate amounts of fair to good quality water.
		PALEOCENE	*Nacimiento-Animas Formation	500-1750	Crops out in a broad band in northern Sandoval County and eastern San Juan County. Underlies central basin north and east of outcrop.	Grey to olive-grey shale and interbedded soft to resistant sandstone; proportion of sandstone increases to north.	Coarse, loosely cemented sandstone beds to the north contain water under artesian pressure.
			*Ojo Alamo Sandstone	50-200	Crops out in Farmington area, central San Juan County; outcrop pattern trends southeast into northwestern Sandoval County and northeastern McKinley County. Underlies central basin north and east of outcrop.	Massive, crossbedded, buff to brown, medium to coarse grained quartz sandstone with minor shale beds and conglomerate lenses.	Coarse, loosely cemented sandstones and conglomerates yield moderate to large amounts of water of variable chemical quality. In subsurface, water is under artesian pressure.
MESOZOIC	CRETACEOUS	UPPER	*Fruitland Formation and Kirkland Shale, undivided	100-1500	Crops out in southern and western San Juan County, and northeastern McKinley County. Underlies central basin north and east of outcrop.	Grey to olive-grey shale, with minor white, brown and green fine to coarse grained sandstone. Fruitland Formation contains coal beds.	Small yields of highly saline water are reported.
			*Pictured Cliffs Sandstone	30-230	Crops out in southern and western San Juan County, and northeastern McKinley County. Underlies central basin north and east of outcrop.	Grey-white, fine to medium grained sandstone, siltstone and shale. Sandstone cemented with bentonitic clay.	Contains highly saline water. Not used as a water source.

TABLE 1. CONT.

AGE			FORMATION	THICKNESS (in feet)	DISTRIBUTION	LITHOLOGY	WATER BEARING PROPERTIES
MESOZOIC	CRETACEOUS	UPPER	*Lewis Shale	500-2000	Crops out in southern and western San Juan County, and northeastern McKinley County. Underlies central basin north and east of outcrop.	Light to dark grey fissile clay shale with minor interbedded siltstone, sandstone and limestone. Grades to sandstone in the south.	Not known to yield water.
			*Cliff House Sandstone	100-350	Crops out in southern and western San Juan County, and northeastern McKinley County. Underlies central basin north and east of outcrop.	Grey, fine to medium grained, well cemented sandstone with interbedded shale.	Shallow sandstones yield fair quality water locally.
			Menefee Formation	400-1000	Crops out in a broad plain in eastern McKinley County. Underlies central basin north and northeast of outcrop.	Olive drab shale with thin sandstone, coal and carbonaceous shale beds. Contains ironstone or limestone concretions. Amount of coal decreases towards top of unit.	Contains small amounts of water near Cebolleta Mountain Large seasonal fluctuations in water levels and flow.
		MESA VERDE GROUP	Point Lookout Sandstone	75-300	Crops out as the caprock of cliffs and mesas northeast of Ambrosia Lake valley. Underlies central basin and Chaco slope basin north and east of outcrop.	Massive, faintly cross-bedded, medium to coarse grained arkosic sandstone with much silty sandstone and shale.	Recharge is from overlying volcanic rocks. In most places water is under artesia presure. Surface seeps may b present locally.
			Gibson Coal Member	275-400	Crops out in the cliffs and mesas northeast of the Ambrosia Lake valley. Underlies Chaco slope and southern central basin north and east of outcrop.	Interbedded shales, clays and sandstones with numerous coal beds. Amount of sandstone increases to the east.	Adequate supply where saturated; high yield in fracture zones.
			Dalton Sandstone Member	35-200	Crops out in the cliffs and mesas northeast of the Ambrosia Lake valley. Underlies Chaco slope and southern central basin north and east of outcrop.	Clean, white, massive sandstone.	Hydraulically connected with Gibson Coal member.
		CREVASSE CANYON FORMATION					

TABLE 1. CONT.

AGE			FORMATION	THICKNESS (in feet)	DISTRIBUTION	LITHOLOGY	WATER BEARING PROPERTIES
MESOZOIC	CRETACEOUS	UPPER	MESA VERDE GROUP, CREVASSE: Dilco Coal Member	120-200	Crops out in the cliffs and mesas northeast of the Ambrosia Lake valley. Underlies Chaco slope and southern central basin north and east of outcrop.	Interbedded thin sand stones, clays and shales with coal lenses. In some areas the upper portion is a massive sandstone.	Adequate supply where saturated. In some places hydraulically connected with Gallup sandstone.
			MESA VERDE GROUP, CREVASSE: Gallup Sandstone	60-200	Crops out in the lower cliffs and mesas northeast of the Ambrosia Lake valley. Underlies Chaco slope and southern central basin north and east of outcrop. Pinches out in the subsurface to the northeast.	Upper portion: fine-medium grained, cross-bedded sandstone with spheroidal calcareous concretions. Lower portion: fine grained silty sandstone with an ironstone cap.	North of Ambrosia Lake valley a few wells yield poor quality water. Better quality water occurs west of this area. Water under artesian pressure, may flow at surface from wells.
			MANCOS SHALE: Satan Tongue	20-500	Crops out in valleys and on lower slopes in the same areas as the Point Lookout Sandstone. Thickens in the subsurface to the northeast.	Tan sandy shale with a few beds of sandstone and dark shale.	Not known to yield water.
			MANCOS SHALE: Mulatto Tongue	200-400	Crops out in valleys between the Dilco Coal member and the Dalton Sandstone member of the Crevasse Canyon Formation. Thickens in the subsurface to the northeast.	Tan sandy shale with a few beds of sandstone and dark shale.	Not known to yield water.
			MANCOS SHALE: Main body of the Mancos	250-1000 Avg 910	Crops out in the floor of the Ambrosia Lake Valley. Thickens in the subsurface to the northeast.	Dark grey calcareous clay-shale. The lower portion has several prominent fossiliferous sandstone beds.	The lower sandstones contain water in most places, with large yields in some areas.
		LOWER	Dakota Sandstone	50-150	Crops out as caprock and along backslopes of cliffs and mesas northeast of I-40. Underlies Ambrosia Lake valley and much of San Juan basin.	Massive quartz sandstone. Upper portion: clean and even bedded. Lower portion: cross-bedded sandstone with conglomerate and coal lenses or beds.	Contains adequate water supplies where saturated. Recharged at outcrops and in fault zones. water flows northward.
	JURASSIC	UPPER	MORRISON: Brushy Basin Member	62-128	Crops out in cliffs and mesas northeast of I-40. Underlies Ambrosia Lake valley and much of San Juan basin.	Gypsiferous mudstone with coarse grained sandstone lenses and minor limestone.	Not used as a water source.

TABLE 1. CONT.

AGE				FORMATION	THICKNESS (in feet)	DISTRIBUTION	LITHOLOGY	WATER BEARING PROPERTIES
MESOZOIC	JURASSIC	UPPER	MORRISON FORMATION	Westwater Canyon Member	30-270	Crops out in cliffs and mesas northeast of I-40. Underlies Ambrosia Lake valley and much of San Juan basin.	Fine-coarse grained, massive, cross-bedded sandstone with some conglomerate, clay, and chert.	Good quantities of water in storage. Recharged at outcrops and in fault zones. Under artesian pressure. Flow is to the north.
				Recapture Member	100-130	Crops out in cliffs and mesas northeast of I-40. Underlies Ambrosia Lake valley and much of San Juan basin.	Siltstone, shale and fine grained sandstone, sandstone predominates near top.	Contains water only where the sandstone units interfinger with overlying or underlying units.
			SAN RAFAEL GROUP	Bluff Sandstone	220-325	Crops out in cliffs and mesas northeast of I-40. Underlies Ambrosia Lake valley, and much of the San Juan basin.	Fine grained, massive, cross-bedded sandstone.	Contains water at most places in the Ambrosia Lake valley, but is usually tapped only where shallower units are above the water table. Under artesian pressure. Flow is to the north.
				Summerville Formation	75-200	Crops out in cliffs and mesas northeast of I-40. Underlies Ambrosia Lake valley, and much of the San Juan basin.	Interbedded fine grained sandstone, siltstone and shale.	Sandstones probably contain water below the water table. Not used as a water source in this area.
				Todilto Limestone	6-30	Crops out in cliffs and mesas northeast of I-40. Underlies Ambrosia Lake valley, and much of the San Juan basin. Pinches out in the subsurface to the north.	Yields water near outcrops, probably contains water elsewhere in the Ambrosia Lake area. Mine dewatering in this unit has reduced well yields locally.	Dark grey to green, fine grained thin bedded, limestone with some gypsum and shale.
				Entrada Sandstone	100-300	Crops out in cliffs and mesas northeast of I-40. Underlies Ambrosia Lake valley, and much of the San Juan basin.	Upper portion: medium to fine grained, cross-bedded sandstone. Lower portion: silty, very fine grained massive sandstone.	Receives little recharge at outcrop; yields water only where recharged by overlying water-bearing formations.
	TRIASSIC	UPPER		Wingate Sandstone	35-90	Crops out near the base of cliffs and mesas northeast of I-40. Underlies Ambrosia Lake valley, and much of the San Juan basin.	Massive, cross-bedded, coarse grained sandstone.	A good aquifer when saturated. Some discharge from seeps and springs south of Ambrosia Lake valley.

TABLE 1. CONT.

AGE			FORMATION	THICKNESS (in feet)	DISTRIBUTION	LITHOLOGY	WATER BEARING PROPERTIES
MESOZOIC	TRIASSIC	UPPER	CHINLE FORMATION				
			Upper Member (Owl Rock)	900-1000	Crops out in Zuni Mountains and along I-40 in the Bluewater area. Underlies Ambrosia Lake valley and much of the San Juan basin.	Siltstone and mudstone with lenses of sandstone and nodular limestone.	Several of the sandstone lenses serve as local aquifers.
			Middle Member (Petrified Forest)	60-225	Crops out in Zuni Mountains and along I-40 in Bluewater area. Underlies Ambrosia Lake valley and much of the San Juan basin.	Sandstone with siltstone and mudstone partings.	This unit is a persistant aquifer in the Ambrosia Lake valley. Under artesian pressure. Flow is to the north.
			Lower Member			Thin bedded silty sandstone, siltstone and mudstone.	Several of the sandstone horizons serve as local aquifers.
			Shinarump Conglomerate	0-100	Crops out in Zuni Mountains. Underlies Ambrosia Lake valley and much of San Juan basin.	Poorly sorted conglomerate, sandstone and siltstone with interbedded mudstone.	Locally highly porous and permeable.
PALEOZOIC	PERMIAN	LEONARD	San Andres Limestone	0-150	Crops out in Zuni Mountains. Underlies Ambrosia Lake valley and much of San Juan basin. Pinches out in the subsurface to the north.	Upper portion: cherty, fossiliferous limestone. Middle portion: buff sandstone and limestone. Lower portion: blue-grey limestone with some sandstone.	A consistent aquifer due to solution channels in the limestone. Moderate yields in Ambrosia Lake valley. Permeability decreases with increasing distance from outcrop. Under artesian pressure. Flow is to the north.
			Glorieta Sandstone	120-220	Crops out in Zuni Mountains. Underlies Ambrosia Lake valley and much of San Juan basin.	Medium grained quartz sandstone with some siltstone. The upper portion has a tight silica cement in some areas.	Good continuity as a widespread porous sandstone blanket deposit. Best developed on Chaco slope. Generally forms a continuous aquifer with the San Andres limestone. Where they are separated, Glorietta usually has lower yields. Water is under artesian pressure. Flow is to the north.

TABLE 1. CONT.

AGE			FORMATION	THICKNESS (in feet)	DISTRIBUTION	LITHOLOGY	WATER BEARING PROPERTIES
PALEOZOIC	PERMIAN	LEONARD	Yeso Formation	350-600	Crops out in Zuni Mountains. Underlies Ambrosia Lake valley and much of San Juan baain.	Upper portion: even bedded siltstone with some gypsum. Lower portion: cross-bedded, fine grained sandstone.	Water bearing properties not well known in Ambrosia Lake valley. To the south, yields are adequate for domestic use in a few places. Probably contains artesian water at Ambrosia Lake.
		WOLFCAMP	Abo Formation	450-500	Crops out in Zuni Mountains. Underlies Ambrosia Lake valley and much of San Juan basin.	Reddish-brown arkosic or quartzose sandstone and siltstone.	Water bearing properties poorly known. The sandstone units are probably water bearing though yields could be somewhat low.
	PENNSYLVANIAN		Madera (?) Formation	175-480	Subcrops in San Juan basin north of Zuni uplift near Ambrosia Lake valley. Underlies much of San Juan basin; also called Hermosa Formation in subsurface.	Conglomerates, arkose, shale and limestone.	Not known.
			Sandia Formation	0-200	Subcrops in San Juan basin north of Ambrosia Lake valley. Underlies most of San Juan basin; also called Molas Formation in subsurface.	Sandstone, shale and limestone.	Not known.
	MISSISSIPPIAN		Arroyo Penasco Limestone	0-150	Subcrops in San Juan basin north of Ambrosia Lake valley. May be correlative with Leadville Limestone and Elbert Formation of northern San Juan basin.	Limestone, locally dolomotized.	Not known.
			Ignacio Quartzite	0-150	Subcrops in San Juan basin north of Ambrosia Lake valley.	Quartz sandstone, shale lenses.	Not known.
PRECAMBRIAN			Igneous and metamorphic rocks, undifferentiated	-	Crops out in Zuni Mountains, underlies entire San Juan basin.	Granites, gneisses, schists and greenstones.	Not known.

*Not present in the vicinity of Ambrosia Lake valley.

REFERENCE 4

Ref 4 Silver Spur Mine 1

March 22, 2005

Purpose Site Reconnaisance to the Silver Spur Mine site and other sites within 2 miles.

Personal Robin Brown & Jake Ingram NMED SOS
Also Stanley Edison & Jerry Begay Navajo EPA

Weather mostly clear with high

Leave Thoreau, head East on I 40, take Prewitt Exit. Turn right on Road 122 into Prewitt (Odometer Reading 763.2.)
Turn North onto gravel road following sign to Haystack at Odi 765.5.
Go under Railroad go North then east, continue on road, take left fork at the Tietjen Ranch
Turn right at Blackwood Rd sign at Odi 772.8
Cross 2 cattle guards
Turn right on undeveloped double track road.
Go East (there ~~was~~ was one branch to south)
Stop at odi 777.8

Stanley and Jerry have a gamma detector, we took a reading at the cars.

Jerry's Magellan GPS
GPS point DAK1; 236768 E 3919475 N
Y Reading 16 to 17 mRoentgen/hr
GPS Point 236835 E 3919518 N
X 44 mR/hr

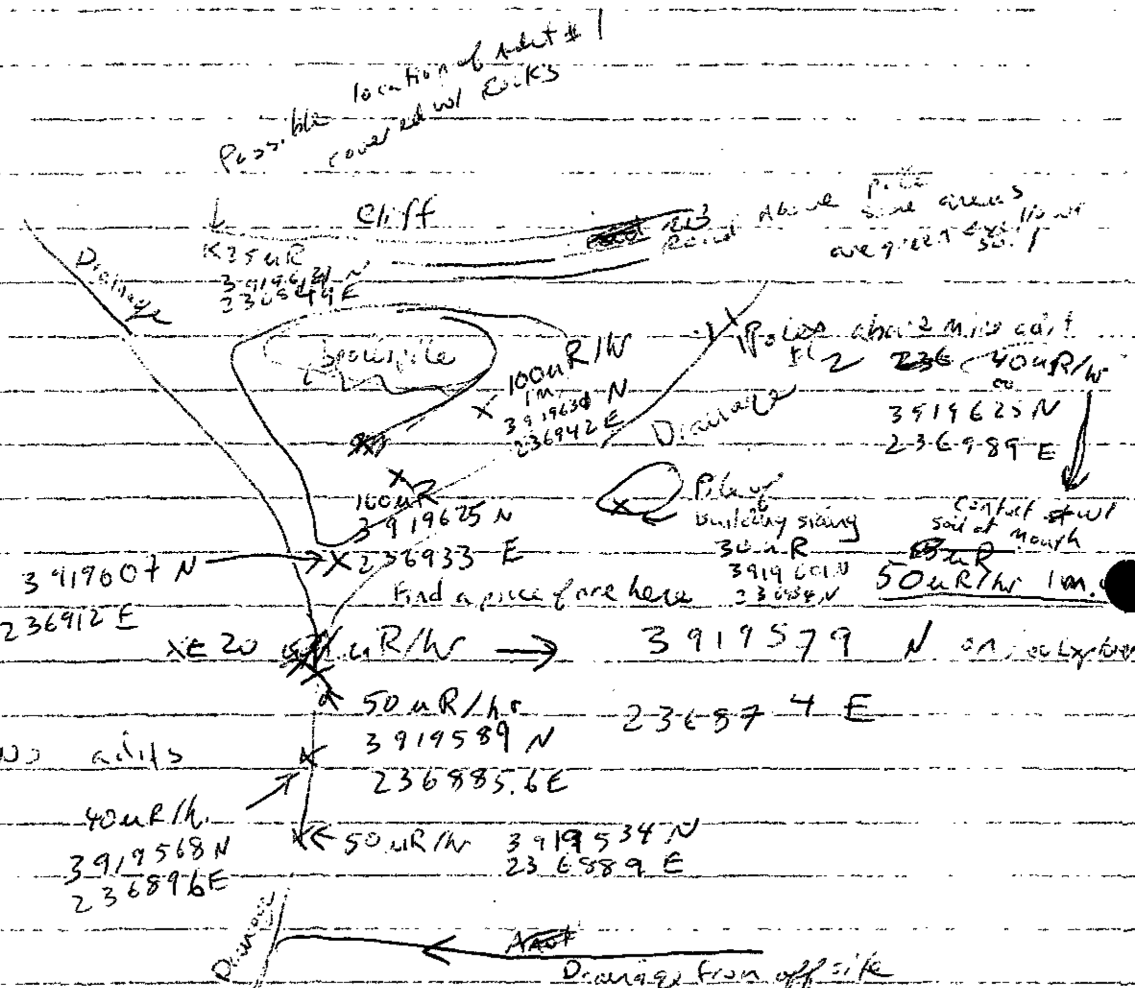
3/22/05

2

Silver Spur Mine

3/22/05

1:15 Jake takes a picture of minesite



1:32 Jake takes picture down adit. The [illegible] of opening shows soil spilling out of front

Cars parked
X First Point
3919451 N, 2369331.2 E
25 uR/hr
28uR/hr
3919466N
236781 E

There are a lot of sheep tracks and scat in the area

Area called spoils pile has debree such as wood, shingles, metal pipe w/ perforations, electrical insulators

X 14uR/hr
3919428N
236794E

2:00 leave Dakota Mine Site

[illegible] 3/22/05

Silver Spur Mine

3/22/05

There are no barriers such as fenced at this site. Cattle near the main road also have access to the mine area.

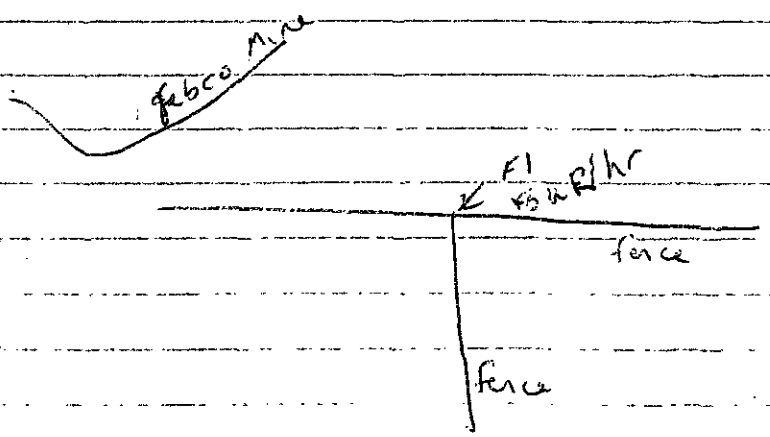
There is a stock well at ~ 3919471 N 236761 E RS 3/22/05

2[15] Head to Febco Mine
At Black wood sign turn to North (go straight on original road)

Red Mountain Road Od 776.9 (10 to 15 residences?)
Mary Residence at 7773
Od 7773 Turn right onto very rough 2-track road
Od 7774 Open gate
Continue North past residences

These residences are located in Section 7 south of the mines RS 3/22/05

2[20] Stop at Drainage continue with Stanley and Jerry to fence line
Cross fence which may mark the section boundary
Take F1 at Boundary of 2 fences



2[25] Take taken picture of febco from ~300 ft to east (looking West)

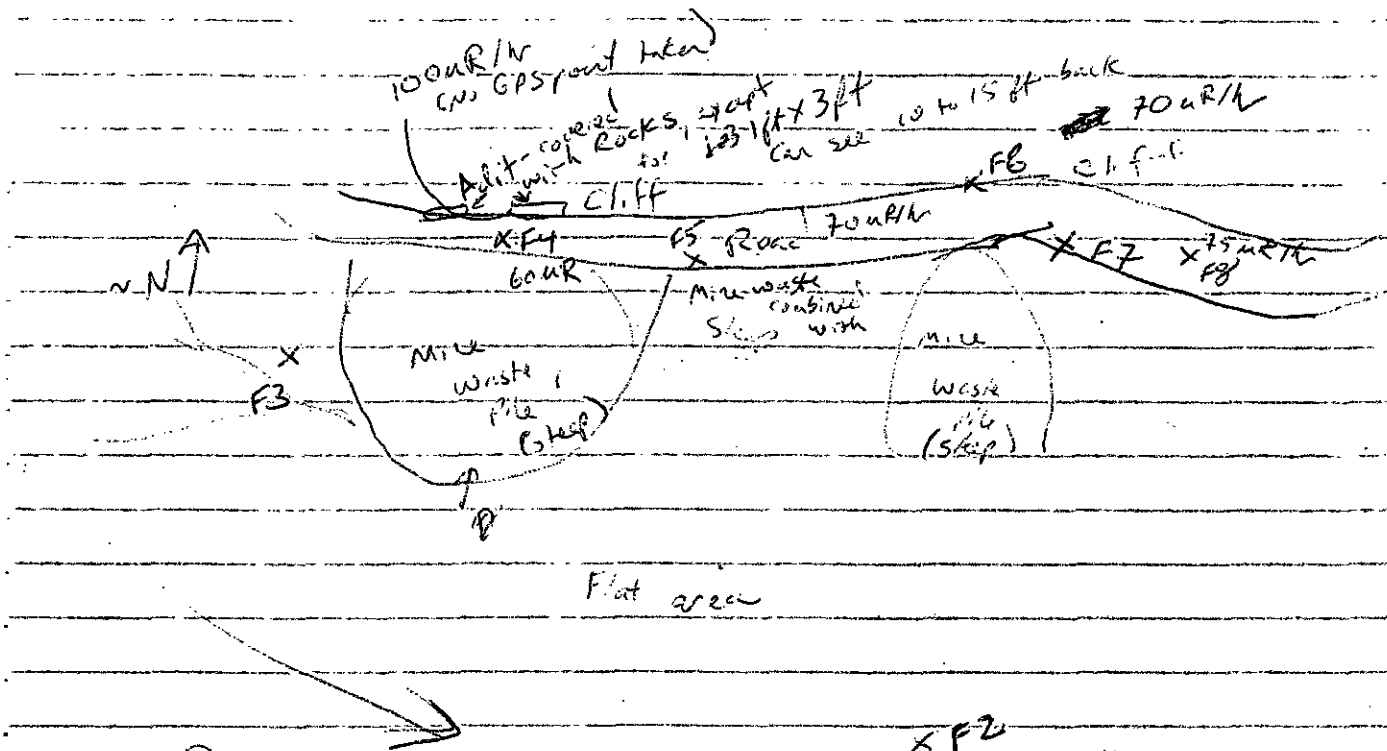
3/22/05

4

Silver Spur Mine

3/22/05

γ-readings at 1m above surface unless otherwise noted



Harley says that the high uR/hr at adit are from rocks flaking off the top, ; Natural radiation, not brought up from the mine.

3/22/05

Silver Spur Mine

3/22/05

AM

The waste pile of soil below is fine black

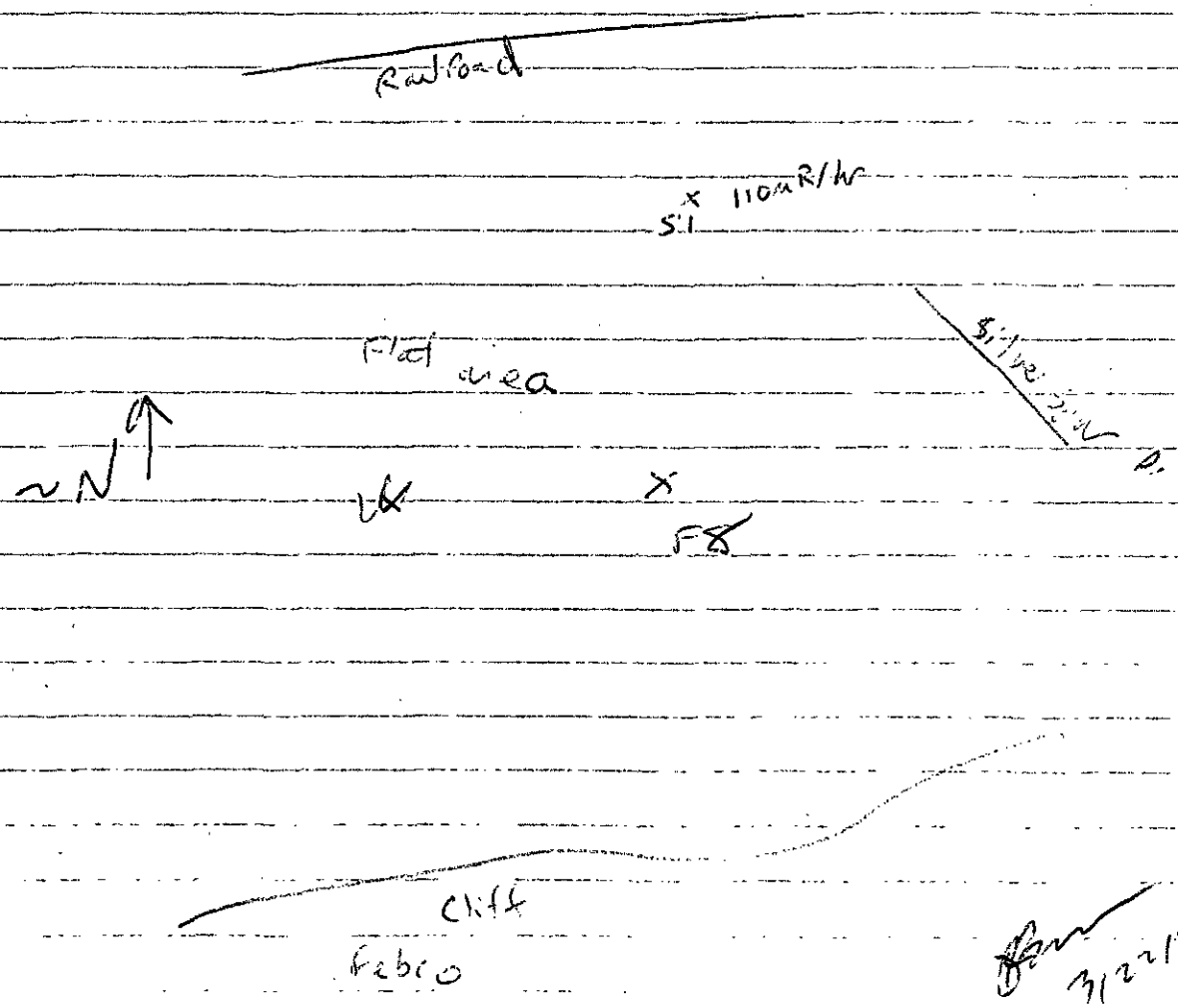
Jerry says this is from coal.

2:54 Walk over hill to Silver Spur Mine

FS Area between Febco & Silver Spur

10 uR/hr

We can see a railroad track



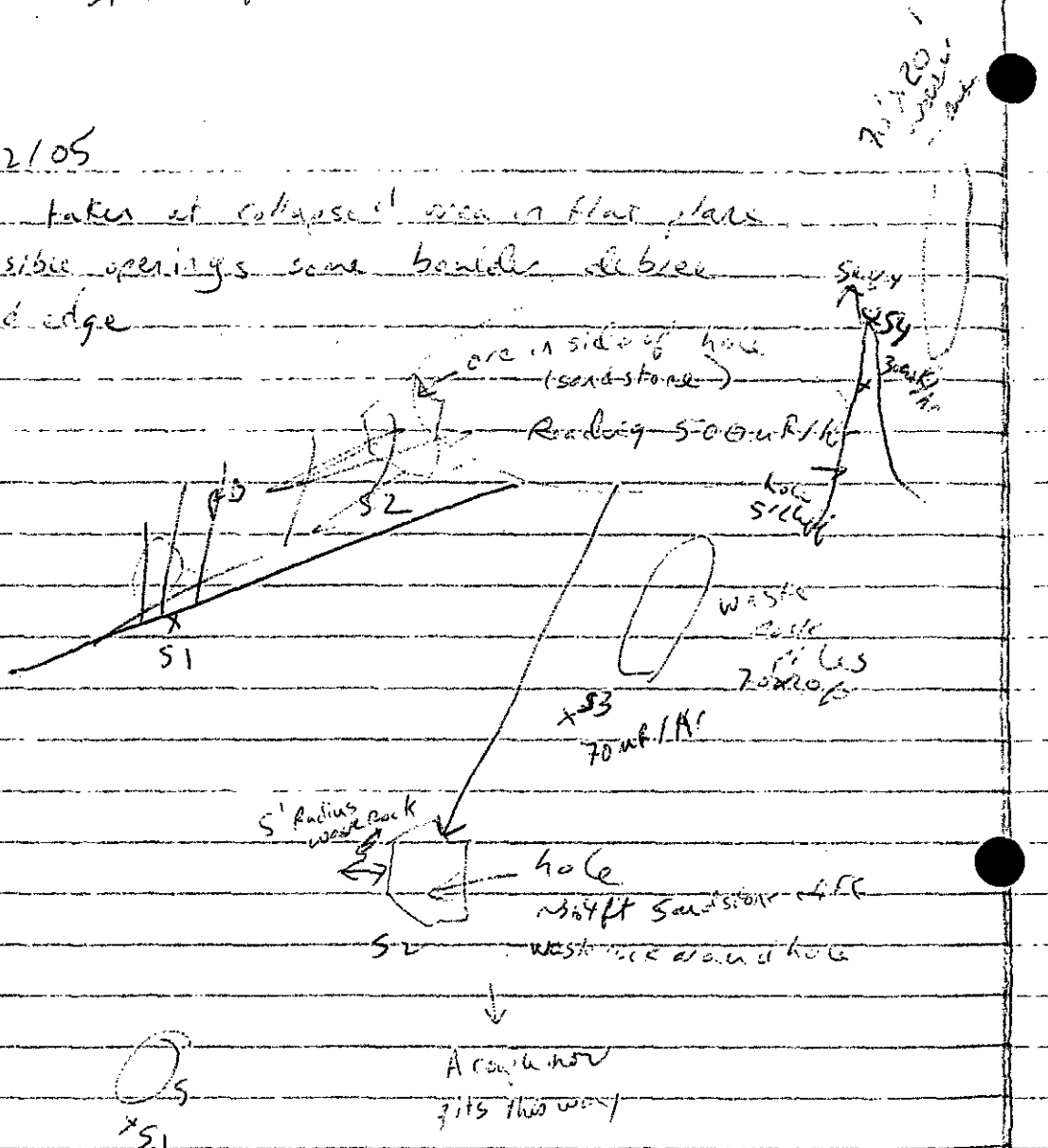
3/22/05

6/

Silver Spar Mine

3/22/05

Point S1 taken at collapsed area in flat place
No visible openings some boulder debris
around edge



At S4 There is an adit that goes back about 40' (visibly)
Stanley and Jerry entered the adit and are
taking pictures

3:30 Leave S4, climb down cliff into drainage

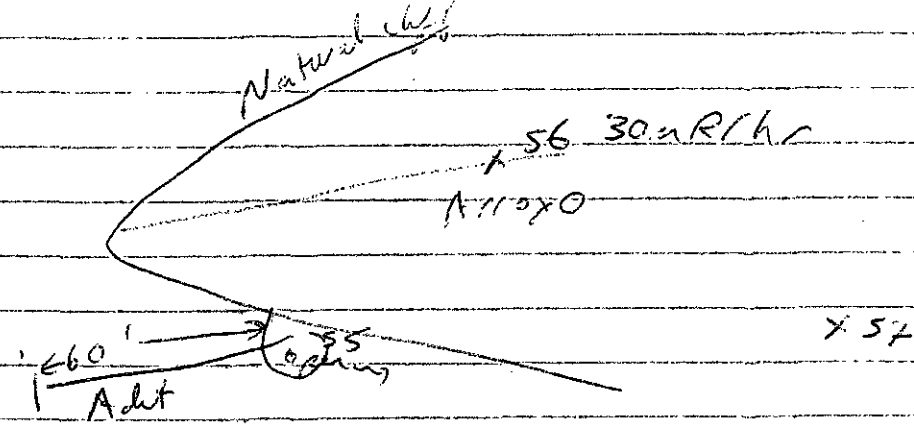
Point S5 260 uR/hr (background) Adit with a big opening 7'9"
There are cans in the drainage indicating
possible recreational use.
Shaft dead ends 60' back

3/22/05

Silver Spur Mine

3/22/05

Rock debree from 55 Adit opening
dumped in aroyo in front of adit



57 is at an sandstone walled ruin.
There is evidence of recent access in area with
freshly cut trees & tire tracks

3[45] Walk back along & down aroyo, rock road
leading from mine to south[east] towards fenced line.
Note sheep and cow tracks plus cow manure
Stanleys email is pasi_swa@frontiernet.net

16:20 Arrive back at vehicles, leave site.

There is a school or day care area on the
road heading to the community near the site (in
Section 7). I didn't get the location of
the ~~d~~ school. There was a sign "Haystack Headstart"
On the way out we saw a school bus driving
to the community. Also people kept horses, pigs,
~~llamas~~, sheep, dogs.

[signature] 3/22/05

Silver Spur Mine

3/22/05

Go to Prewitt site, then head back to Santa Fe

8:00 Arrive in Santa Fe

3/22/05

Silver Spur Mine

5/6/05

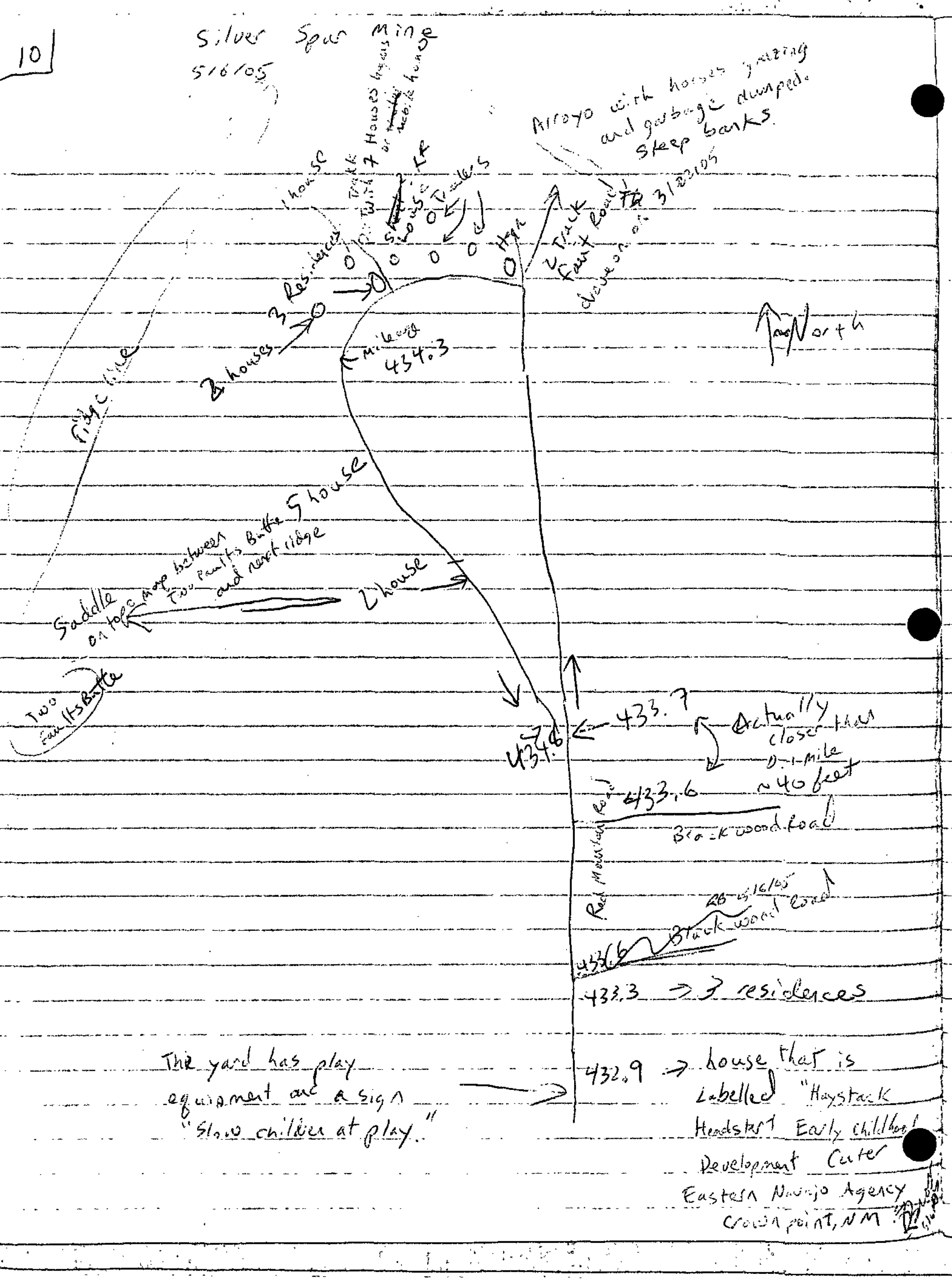
Objective: Find location of day care on road to site and count houses near site.

9[00] Depart Counts. of the This trip is part of UNC Church Rock Site visit
Mileage 120 694
Car: personal vehicle Saturn SW2 License # 623 MYX
Travelling with: Robin Brown (NMED) and Marc & Brendan Leonard

9[20] Exit at Prewitt (Exit 63) Mileage 120 715
Turn onto Haystack Road.
Sign at intersection for Tietjen Ranch, noted that the road to Haystack is called the Red Mountain Road.

9[33] Mileage 431.6 start seeing houses on the left side of the road between the road and the cliffs of Haystack Mountain. These houses are noted on the topo map.
Mileage 432.7. Note 3 houses on right side of road, about 0.1 to 0.2 miles apart from each other. Approaching Two Faults Butte
Note houses on left side of road near Two Faults Butte. These houses are also on the topo map
Mileage 433.6 pass Blackwood Road.
Mileage 434.1 There are houses along the road that are not marked on the topo map.

5/6/05


Silver Spur Mine
5/6/05
Arroyo with horses grazing and garbage dumped. Steep banks
driveway on 3/23/05
Dirt Track Fair Road
High
Trailers
2 TF
Track with 7 Houses or mobile homes
1 house
3 Residences
2 houses
Mileage 434.3
North
Ridge line
5 house
Saddle on topo map between Two Faults Butte and next ridge
2 house
Two Faults Butte
433.7
434.6
Actually closer than 0.1 mile ~40 feet
433.6
Black wood Road
Red Mountain Road
RB 5/6/05
Black wood Road
433.6
433.3 → 3 residences
The yard has play equipment and a sign "Slow children at play."
432.9 → house that is Labelled "Haystack Headstart Early Childhood Development Center Eastern Navajo Agency Crownpoint, NM"

5/6/05 RB

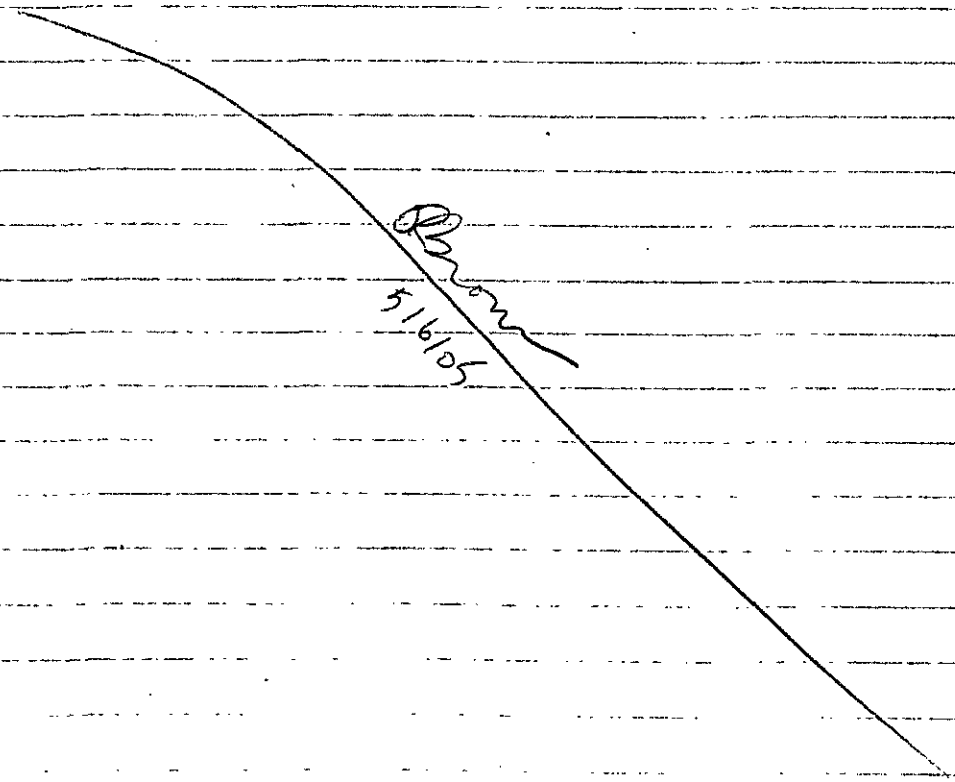
10^05 ~~Leave~~ Depart Haystack area.

On the 3/22/05 site visit, I observed that there are no residences or day cares located within 200 feet of the Febco or Silver Spur mines.

RB

The arroyo ~~to the~~ to the north and east of the Haystack community ~~they~~ passes near the Febco mine and may carry sediment load from the mine area.

10^25 Mileage 446.5 or (120738) get back on the interstate, (40) head back ~~to~~ East towards Grants.



12

Silver Spur mine

6/15/05

The following table shows GPS points collected at the Dakota Mine on 3/22/05. The coordinates have been corrected using Path Finder software.

Comment	Max_PDOP	Corr_Type	Rcvr_Type	GPS_Date	GPS_Time	Update_Sta
DAK1	3.8	Differential	GeoExplorer 3	3/22/2005	01:04:15pm	New
	3.8	Differential	GeoExplorer 3	3/22/2005	01:07:07pm	New

Comment	Feat_Name	Datafile	Unfilt_Pos	Filt_Pos	Data_Dicti	GPS_Height
DAK1	Point	R032220A.cor	31	31	Generic	2165.285
	Point	R032220A.cor	1	1	Generic	2165.279

Comment	Vert_Prec	Horz_Prec	Std_Dev	Northing	Easting	Point_ID
DAK1	4.470	2.241	1.426363	3919471.467	236770.172	1
	5.445	2.673		3919468.559	236769.449	2

The following table shows GPS points from the Febco & Silver Spur mine sites.

Comm	Max_PDOP	Corr_Type	Rcvr_Type	GPS_Date	GPS_Time	Update_Sta
F1	3.2	Differential	GeoExplorer 3	3/22/2005	02:24:16pm	New
F2	4.9	Differential	GeoExplorer 3	3/22/2005	02:33:31pm	New
F3	3.0	Differential	GeoExplorer 3	3/22/2005	02:37:27pm	New
F4	5.2	Differential	GeoExplorer 3	3/22/2005	02:40:02pm	New
F5	4.7	Differential	GeoExplorer 3	3/22/2005	02:43:19pm	New
F6	4.8	Differential	GeoExplorer 3	3/22/2005	02:49:01pm	New
F7	4.8	Differential	GeoExplorer 3	3/22/2005	02:50:26pm	New
F8	4.2	Differential	GeoExplorer 3	3/22/2005	02:51:59pm	New
F8	3.9	Differential	GeoExplorer 3	3/22/2005	03:02:35pm	New
S1	5.4	Differential	GeoExplorer 3	3/22/2005	03:08:35pm	New
S2	4.1	Differential	GeoExplorer 3	3/22/2005	03:11:21pm	New
S3	5.3	Differential	GeoExplorer 3	3/22/2005	03:18:00pm	New
S4	5.6	Differential	GeoExplorer 3	3/22/2005	03:22:39pm	New
S5	4.9	Differential	GeoExplorer 3	3/22/2005	03:35:57pm	New
S6	2.4	Differential	GeoExplorer 3	3/22/2005	03:42:43pm	New
S7	4.1	Differential	GeoExplorer 3	3/22/2005	03:46:52pm	New

6/15/05

Silver Spur Mine

13

6/15/05

Continuation of 3/22/05 Fabco & Silver Spur Mine GPS Tables

The data has been corrected using Path Finder

	Feat_Name	Datafile	Unfilt_Pos	Filt_Pos	Data_Dicti	GPS_Height
F1	Point	R032221B.cor	20	20	Generic	2171.141
F2	Point	R032221B.cor	2	2	Generic	2180.273
F3	Point	R032221B.cor	10	10	Generic	2185.713
F4	Point	R032221B.cor	22	22	Generic	2196.381
F5	Point	R032221B.cor	14	14	Generic	2198.775
F6	Point	R032221B.cor	1	1	Generic	2201.810
F7	Point	R032221B.cor	10	10	Generic	2196.354
F8	Point	R032221B.cor	5	5	Generic	2196.822
F8	Point	R032221B.cor	10	10	Generic	2214.254
S1	Point	R032221B.cor	25	25	Generic	2200.314
S2	Point	R032221B.cor	13	13	Generic	2196.387
S3	Point	R032221B.cor	9	9	Generic	2193.970
S4	Point	R032221B.cor	30	30	Generic	2193.185
S5	Point	R032221B.cor	12	12	Generic	2181.128
S6	Point	R032221B.cor	3	3	Generic	2173.441
S7	Point	R032221B.cor	8	8	Generic	2181.592

	Vert_Prec	Horz_Prec	Std_Dev	Northing	Easting	Point_ID
F1	4.603	2.012	0.719814	3920474.301	233221.663	1
F2	6.563	3.644	7.118021	3920545.439	232931.617	2
F3	4.383	1.947	0.406137	3920578.146	232850.087	3
F4	4.334	2.771	0.737933	3920603.055	232880.357	4
F5	4.987	2.342	1.533733	3920596.106	232887.003	5
F6	6.855	3.324		3920604.664	232964.727	6
F7	5.296	2.312	1.004709	3920591.981	232966.419	7
F8	5.772	2.937	1.286849	3920580.960	232983.517	8
F8	3.576	2.055	3.385284	3920974.854	233170.649	9
S1	4.614	4.222	2.481791	3921155.878	233422.449	10
S2	4.354	4.248	1.795831	3921147.168	233454.927	11
S3	3.508	2.357	0.863529	3921207.530	233471.926	12
S4	4.825	3.568	1.915943	3921280.524	233500.930	13
S5	4.326	2.867	0.845171	3921290.478	233605.502	14
S6	3.361	1.987	0.418114	3921267.387	233598.775	15
S7	3.752	2.785	0.665277	3921130.290	233537.709	16

6/15/05

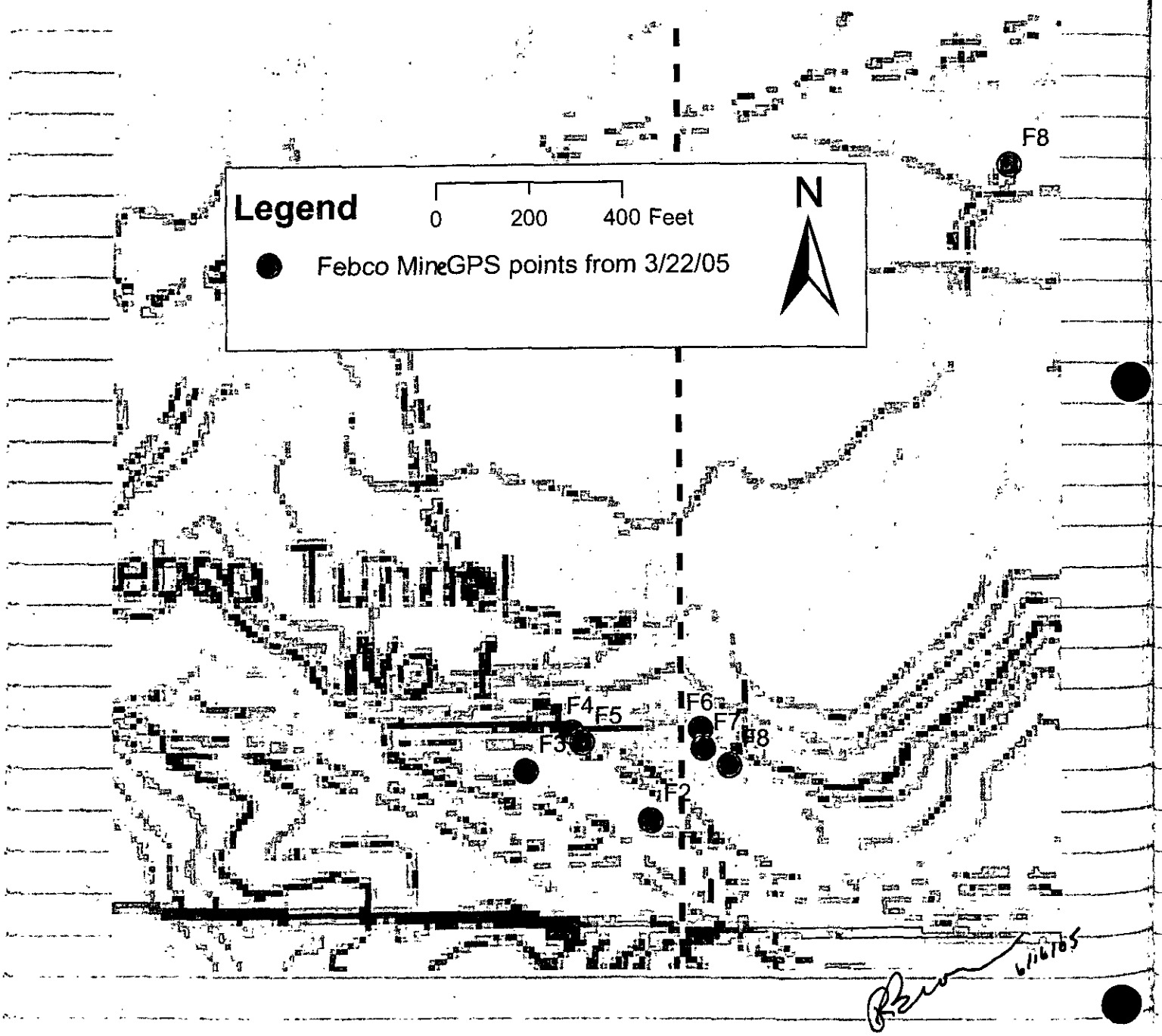
1/15/07

14

Silver Spur Mine

6/16/05

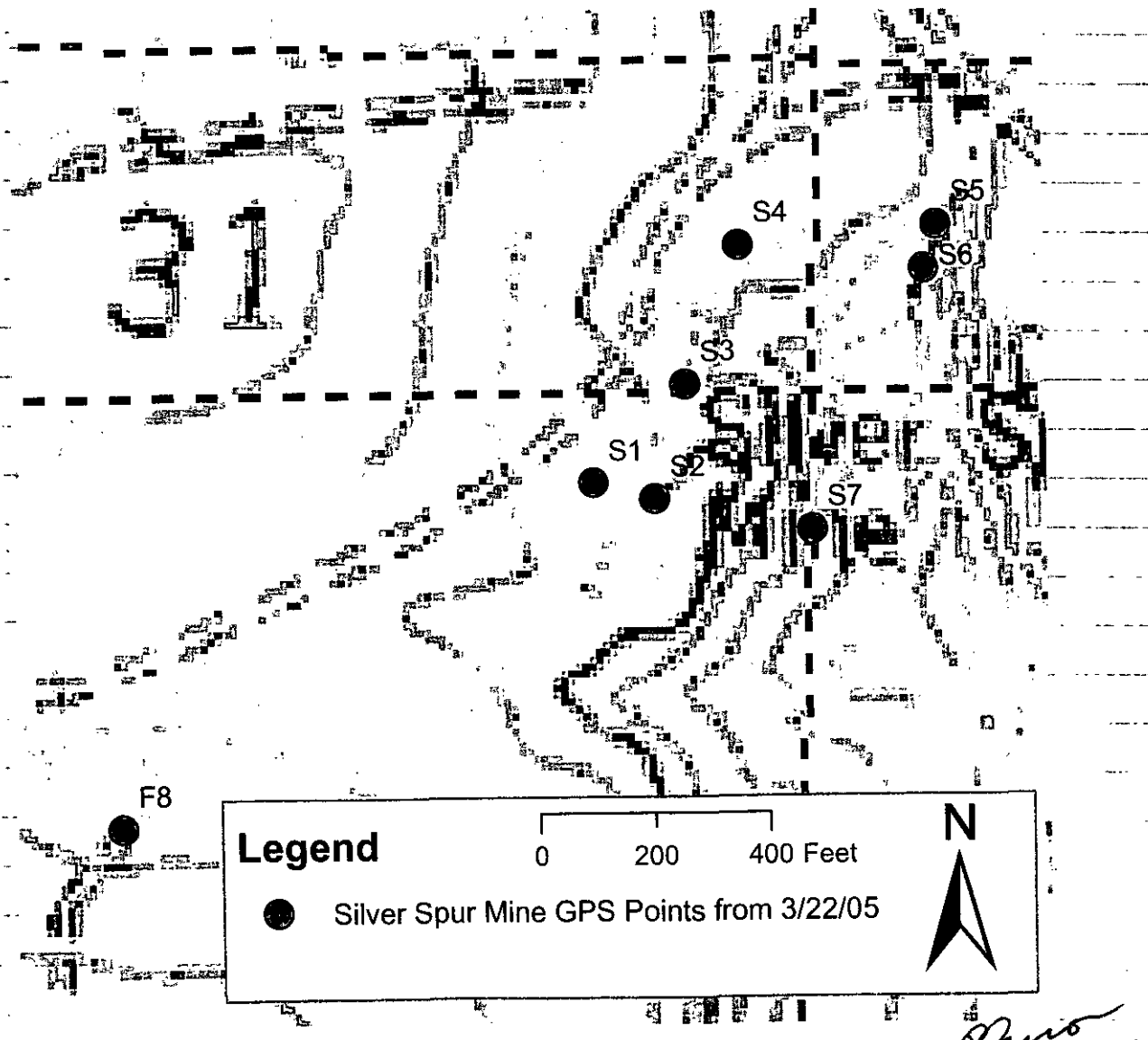
The following map shows locations of GIS coordinates that Robin Brown collected on 3/22/05. The coordinates overlay a topographic map of the ~~area~~ RB Febco tunnel area



Silver Spur Mine

6/16/05

The following map shows locations of GIS coordinates that Robin Brown collected on 3/22/05. The coordinates overlay a topographic map of the Silver Spur mine area.



6/16/05

16

Silver Spur Mine

6/16/05

The following ~~is a~~ RS a shows the gamma Ray detectors Calibration record for the detector used on 3/22/05. Jake Ingram recorded this information.

Survey Meter Calibration Record

- This machine was provided by Navajo Nation EPA employees Stanley Edison and Jerry Begay
- Model 19 Serial # 64216
- X 5000 √
- X 500 √
- X 250 √
- X 50 √
- X 25 √
- Calibration Date 5 April 2004
- Due Date 5 April 2005
- Calibrated by: MMT
- Ludlum Measurements Inc.
- 325-235-5494
- Ludlum Inc.
- Sweetwater
- Micro Meter
- Instument reads gamma
- Units: Micro Roentgen/hr
- Most readings 1 meter off the ground
- Some contact readings
- Battery Check Passed
- Stanley stated normal background reading for the Window Rock Arizona region are 12-15 micro R/hr
- Datum WGS84 1st background reading at the cars was 16-17 μ R/hr at UTM 236768E 3919475N Zone 13; 2168 meter altitude

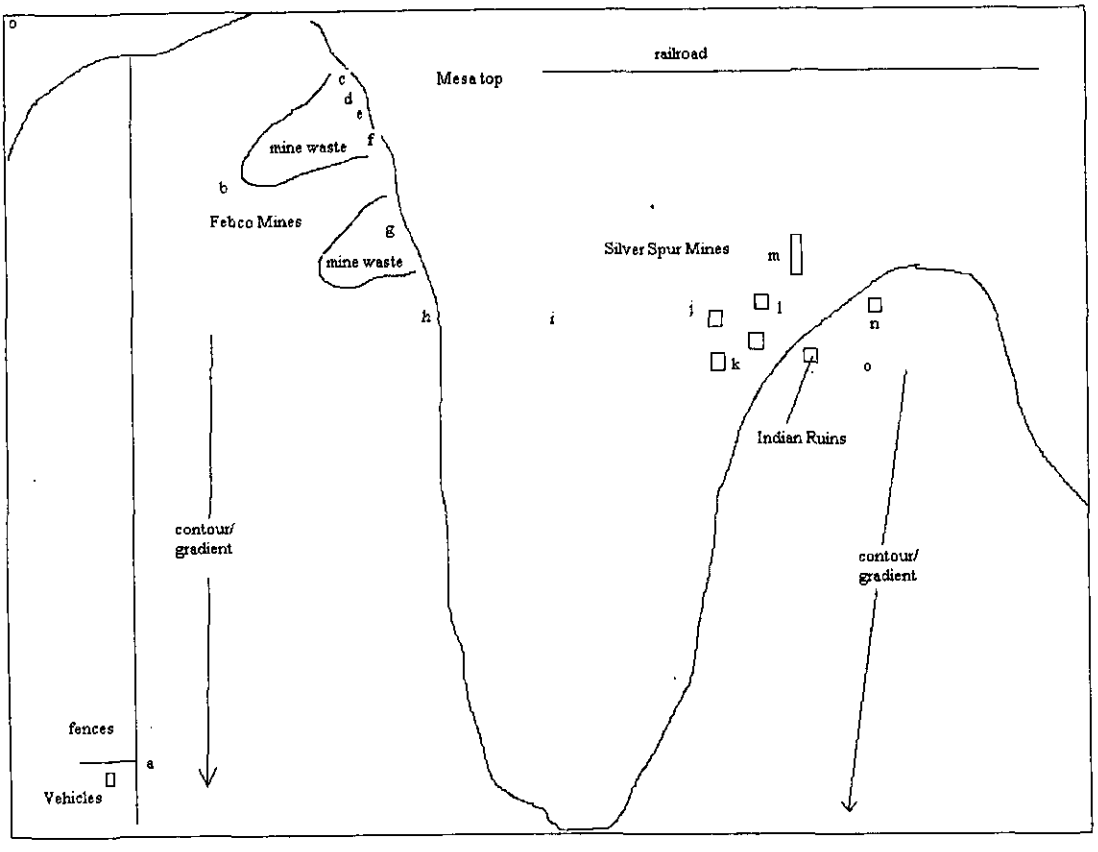
7/11/05

Silver Spur mine

L17

7/18/05

The following is a not-to-scale map produced by Jake Ingram from the site visit on 3/22/05 and a table showing Coordinates and gamma readings from Navajo Nation EPA instruments.



Map Letter	µ R/hr 1 meter above ground surface	Easting	Northing	Description
a	18	233220E	3920475N	
b	150	232937E	3920549N	
c	70	232856E	3920606N	
d	60	232878	3920610N	
e	40			Mine entrance
f	70	232897E	3920605N	
g	70	232966E	3920608N	
h	75	232983E	3920588N	(2:54 pm)
i	10	233169E	3920977N	
j	110	233419E	3921162N	
k	500	233461E	521155N	
l	50-70	233472E	3921210N	
m	300	233505E	3921286N	Deep shaft 50 ft + (3:30 pm)
n	260	233601E	3921288N	Deep shaft 50 ft
o	30	233602E	3921267N	
Ruins		233537E	3921130N	Recent wood cutting and tire tracks

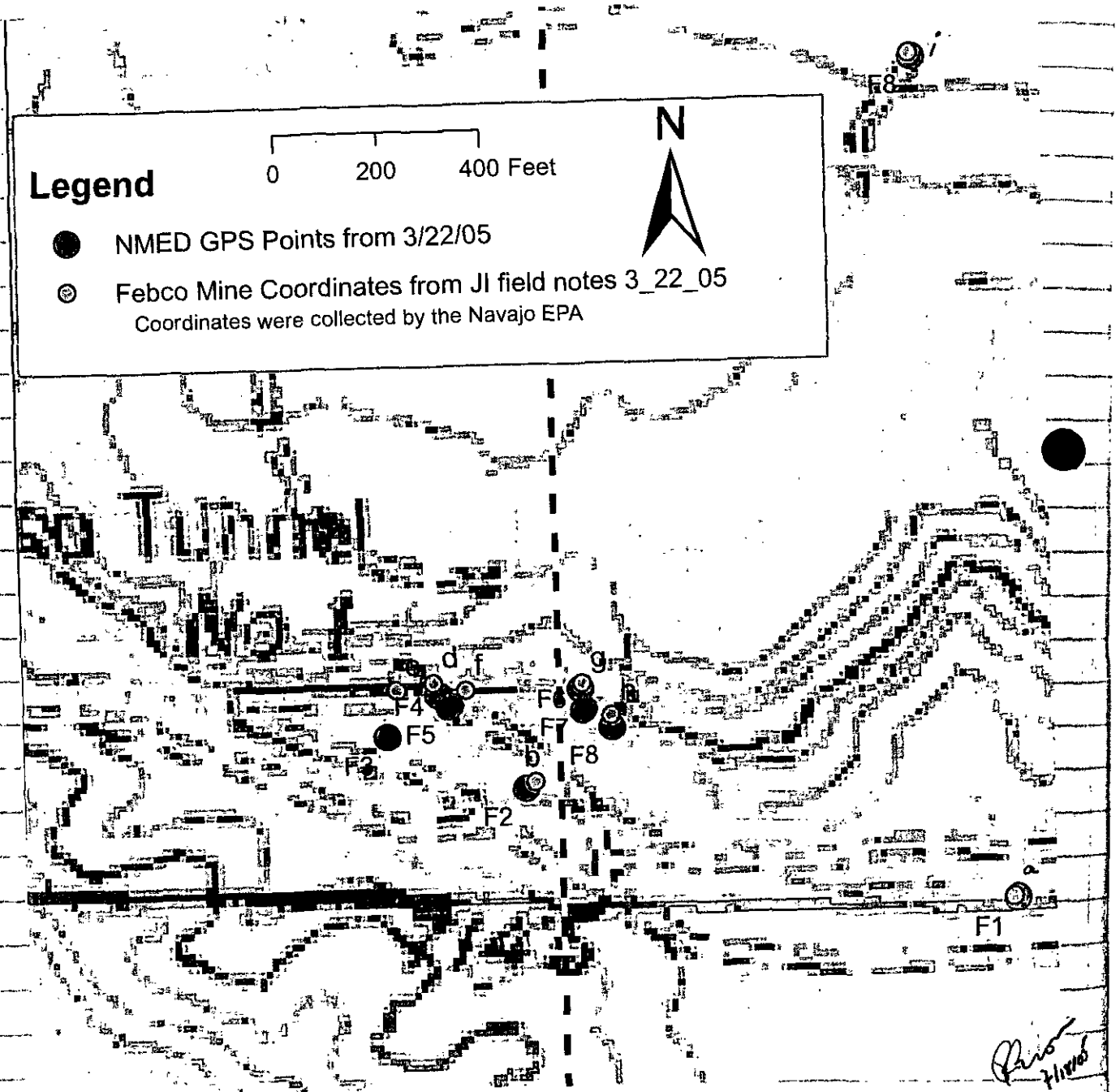
7/18/05

18

Silver Spur Mine

7/18/05

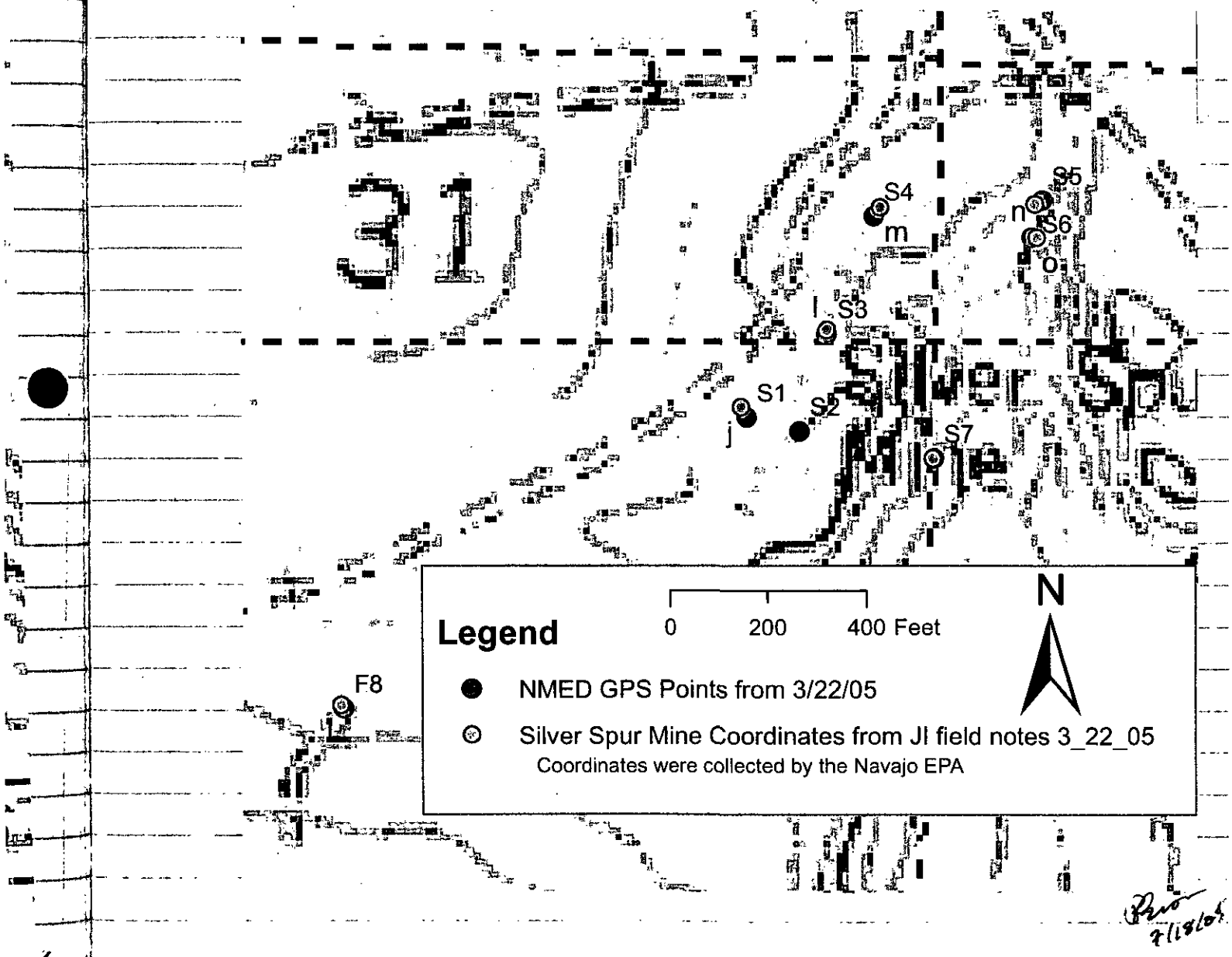
Below is a map produced using GIS showing coordinates collected by NMED instruments (Green, large) and Navajo EPA (Purple, small) on 3/22/05



Silver Spur Mine

7/18/05

Below is a map produced using GIS showing coordinates collected by NMED instruments on 3/22/05 (Green, large) and Navajo EPA (Purple, small) on 3/22/05



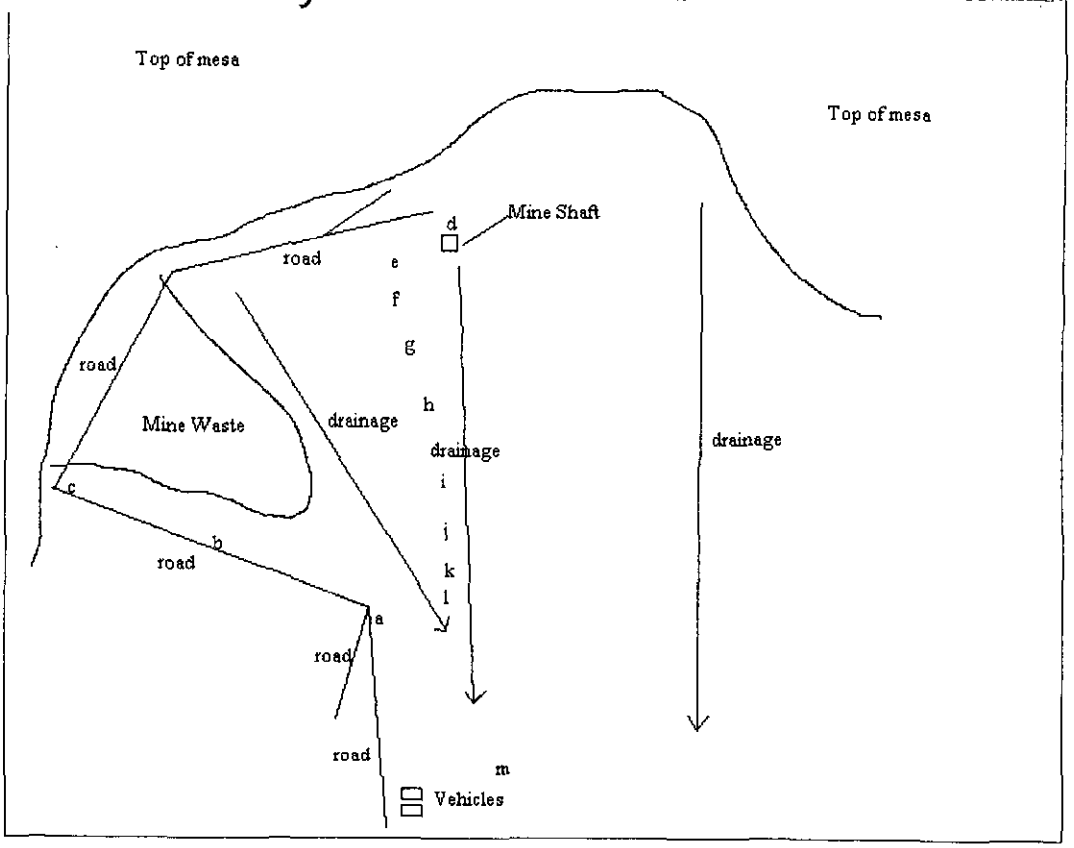
7/18/05

20

Silver Spur Mine

7/18/05

The following is a not-to-scale map produced by Jake Ingram from the site visit on 3-22-05 to the Dakota Mine and a table showing coordinates and gamma readings from the Navajo EPA instruments



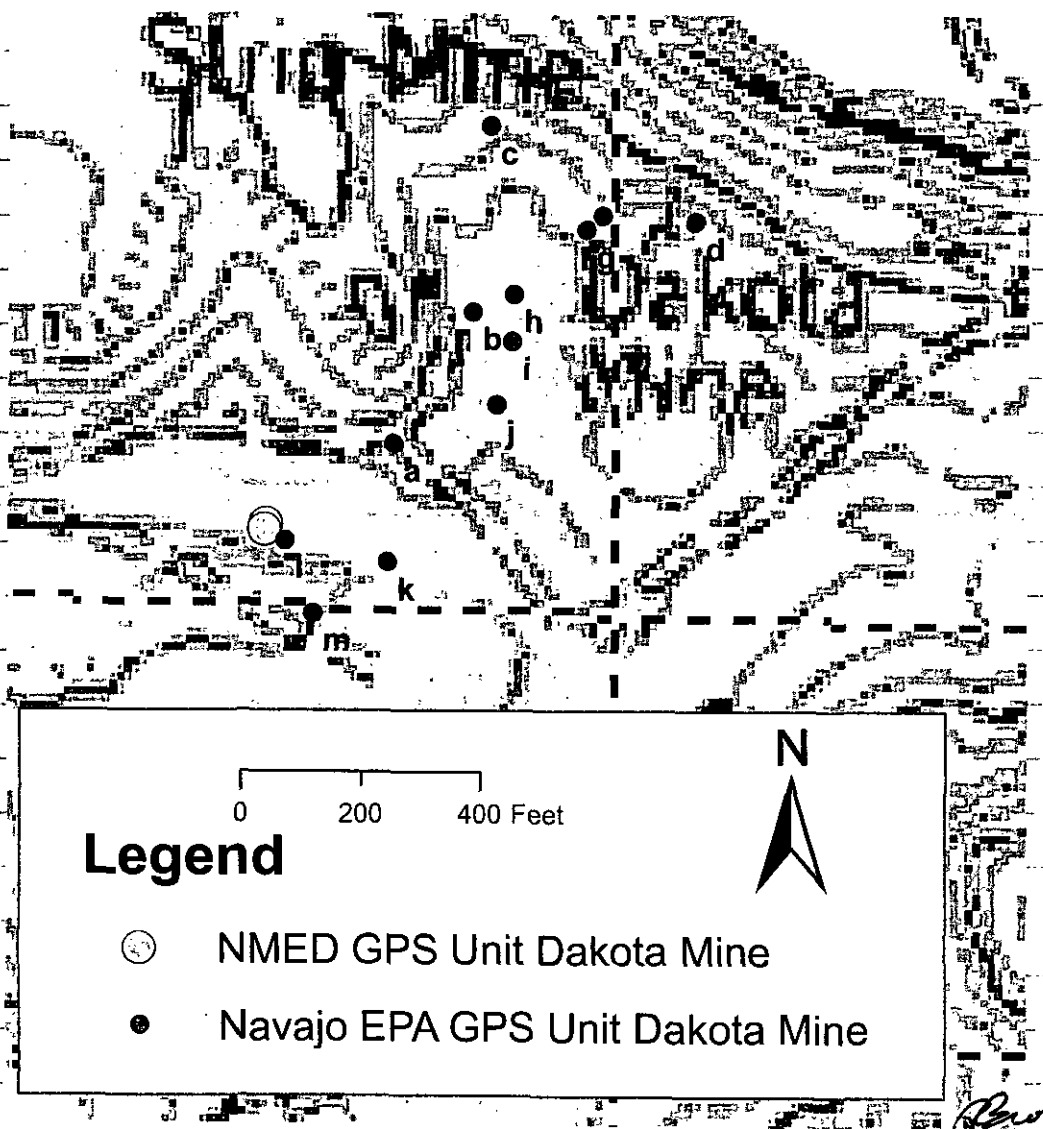
Map Letter	µ R/hr; Distance Above Ground Surface	Easting	Northing	Description
a	44; 1 m	236835E	3919512N	
b	20; 1 m	236876E	3919579N	
c	25; 1 m	236885E	3919673N	
d	40; 1 m	236989E	3919625N	Mine entrance
e	50; 1 m			
f	100; 1 m	236942E	3919628N	Debris, lumber, shingles, metal
g	160; 1 m 200 contact	236934E	3919621N	
h	50; 1 m	236897E	3919588N	
i	40; 1 m	236896E	3919564N	
j	50; 1 m	236888E	3919532N	
k	25; 1 m	236832E	3919452N	
l	28; 1 m	236780E	3919463N	
m	14; 1 m	236794	3919426N	

7/18/05

Silver Spur Mine

7/18/05

Below is a map produced using GIS showing coordinates collected by NMED instruments (Pink, large) and Navajo EPA instruments (Green, small) on 3/22/05



7/18/05

18/05

22

Silver Spur Mine

~~Silver~~ RB 10/20/05

While on the site visit on ~~12~~ 3/22/05, no water was observed in ~~the~~ surface water drainages near the Fe60, Silver Spur, or Dakota Mine sites

Brown

REFERENCE 5

ENVIRONMENTAL PROTECTION AGENCY

THE NAVAJO NATION

Window Rock, Arizona 86515

JOE SHIRLEY, JR.
PRESIDENT

FRANK DAYISH, JR.
VICE-PRESIDENT

FEB 2006

February 13, 2006

Robin Brown
P.O. Box 26110
Harold Runnels Building
GWQB-SOS, Suite 2300 N
1190 St. Francis Drive
Santa Fe, NM 87505

Dear Ms. Brown:

This is the Navajo Nation EPA - Superfund Program's (NSP) response to your requested review of the drafted Preliminary Assessment Addendum on the Febco Mine site. The site adjoins the Navajo Nation at the northern perimeter of the Baca/Haystack Chapter area. There are a few comments and are as follows:

Section/ Subsection	Comment(s)
2.1	Actual site coordinates are latitude 35°23'**36**" North and longitude 107°56'**28**"West.
3.1	Reference cited throughout the two paragraphs is probably #4 and not #3 as written. *Note:* Reference 12 was not used.
3.2.1	To get a good perspective on area size, it's prudent to include acreage. Thus, "...11,800 square feet **(0.27 acre)**..." and "...129,039 square feet **(2.96 acres)**."
3.2.2	In Pathway Description paragraph, **uR/hr** should be used for microRoentgens per hour.
3.2.3	In Targets paragraph, some text needs to be included to take into account that the stock tank (reservoir) near the Haystack community is repairable, and when in use can accumulate contaminated sediment that have migrated from mines upstream. This would pose a risk of exposure to nearby residents (swimming) and to the area livestock (watering). *Note:* Reference #12 was used after reference #14.
3.2.5	In the Pathway Description section. The third paragraph has "√" symbol that needs to be clarified or explained. There is one r in picoCuries and MCL stands for maximum contaminant **level**.

Section/ Subsection	Comment(s)
3.2.5	In the Targets section, NSP would like to see more discussion and additional facts on Well 16B-38. It appears to be a good half-mile off to the east in Figure 3; it should be just below the Haystack community's access (bus route) road.
IV	The Summary and Conclusions section should include our comment on the stock tank (reservoir) near the Haystack community. NSP assumes that the background soil designation includes the background samples for the sediments. Sediment within the stock tank (reservoir) should be included in the sampling event being proposed. If obtaining ground water from Wells 16T-521 and 16B-38, the background ground water should also be taken. The statement was made that "Residences of the Haystack community may be exposed to elevated concentrations of radon and windblown waste from the site." To ascertain this, NSP assumes that sampling of soils around the residences will done. *Note:* References 17 through 24 were not used in this draft document.

Regarding the questions you had at the beginning of your request via e-mail, the "location and type of federally designated sensitive environment" query would be the U.S. Fish & Wildlife map that denotes wetland within one mile of the site. The exact location was not noted in the 1990 PA report we have here. The next question on the source of information on reference #8, it could not be located. On the last question regarding who the author was for the 1958 ore reserve survey, the reference list has it as "AEC." In the years of conducting assessments, AEC usually stood for the Atomic Energy Commission (now the Nuclear Regulatory Commission).

We appreciate the opportunity to comment on this document and hope that it will help in addressing the situation regarding the site. If you have any comments or questions, please contact Mr. Eugene Esplain at (928) 871-7331 for additional information.

Sincerely,

Diana J. Malone

Diana J. Malone, Supervisor
Superfund Program
Waste Regulatory Compliance Dept
Environmental Protection Agency
The Navajo Nation

xc: A.C. Luther, WRC Dept.
S.W. Edison, NSP
E. Esplain, NSP
File/Chrono

REFERENCE 6

Ref 6

THE NAVAJO NATION

P. O. DRAWER 308 • WINDOW ROCK, ARIZONA 86515 • (602) 871-6352-55

PETERSON ZAH
PRESIDENT

MARSHALL PLUMMER
VICE PRESIDENT

February 26, 1991

RECEIVED
MAR 05 1991

Linda Fluke, Water Resources Specialist
Toxic Site Bureau
New Mexico EID
1190 St. Francis Dr.
Santa Fe, NM 87503

Dear Linda,

Enclosed is the Febco abandoned uranum mine site information we discussed. The quad maps are photocopies Lee had made. I couldn't find the originals. As you probably know, the site is located on the Goat Mtn. Quad., McKinley Co., New Mexico.

I'll try to explain some things about the first map. Circled in yellow is the Indian Health Service (IHS)/Navajo Tribal Utility Authority (NTUA) well which supplies most of the Haystack community. This is well 16T-551 or Public Water System I.D. Number NM 0254. The lines from the pump house are the supply lines to the community (not shown in its entirety). The dots along the supply lines are the residences supplied. Some residents get water from stock well 16T-521.

The darker lines, as you know, are the major drainages of the area. The PA's Navajo Superfund has done on the Haystack Mtn. Nanabah and Brown Vandever mines and the Desiderio group may be of some benefit to you. Let us know if you would be interested in reviewing them. The Agency for Toxic Substances and Disease Registry (ATSDR) has issued a health advisory for the Brown Vandever and Desiderio sites. The U.S. EPA has taken samples from these sites, the Nanabah site, and the Haystack area. Also, the IHS has become intensely interested in the area.

Good luck with the PA and the rHRS. I'll tentatively plan to meet you and Stephen at Prewitt on March 11. Please contact myself, Stanley Edison (Desiderio PA), or Gaurav at 602/871-7330,6859 with questions or comments. Also enclosed is the resume of Ross Peebles that NMEID may be interested in. I okayed it with Ross.

Talk to you later,

Tom

Tom Morris, Environmental Specialist
Navajo Superfund Program

APPROVED: _____
JoAnne A. Manygoats, Program Director
Navajo Superfund Program

Enclosures

NAVAJO SUPERFUND OFFICE

FEBCO URANIUM MINE

Reference # 8

LEE V. BIGWATER 5/90

EPA POTENTIAL HAZARDOUS WASTE SITE IDENTIFICATION

REGION: VI | SITE NUMBER:

NOTE: The initial identification of a potential site or incident should not be interpreted as a finding of illegal activity or confirmation that an actual health or environmental threat exists. All identified sites will be assessed under the EPA's Hazardous Waste Site Enforcement and Response System to determine if a hazardous waste problem actually exists.

A. SITE NAME	B. STREET (or other identifier)		
FEBCO URANIUM MINE	35° 23'40" : 107° 56'10"		
C. CITY	**D. STATE**	**E. ZIP CODE**	**F. COUNTY NAME**
PREWITT	NM	87045	MCKINLEY

G. OWNER/OPERATOR (If known)

1. NAME	2. TELEPHONE NUMBER
US-BAI/NAVAJO NATION	

H. TYPE OF OWNERSHIP (If known)

☒ 1. FEDERAL ☐ 2. STATE ☐ 3. COUNTY ☐ 4. MUNICIPAL ☐ 5. PRIVATE ☐ 6. UNKNOWN X 7. TRIBAL

I. SITE DESCRIPTION

The site is an abandoned Uranium mining area. There are three adits driven into the meas cliffs composed of the host rock Cretaceous Dakota Sandstone. The uranium tailings piles are located adjacent to drainages that lead to area wells and agricultural fields. The mines were active in 1952.

J. HOW IDENTIFIED (i.e., citizen's complaints, OSHA citations, etc.)	K. DATE IDENTIFIED (mo., day, & yr.)
Site Discovery via NSO Field Survey	2/15/90

L. SUMMARY OF POTENTIAL OR KNOWN PROBLEM

There is a high potential for transport of radioactive materials via wind and surface water transport mechanism. The adits and tailing piles may leach long-lived radioactive agents to surface waters and shallow aquifers. The site is unfenced and readily accessible.

M. PREPARER INFORMATION

1. NAME	2. TELEPHONE NUMBER	3. DATE (mo., day, & yr.)
Stanley Edison, Navajo Superfund Office	602/871-~~3153~~ 7332	2/26/90

REFERENCE 7

Ref 7

PRELIMINARY ASSESSMENT

DATE : June, 1990

PREPARED BY: Tom Morris, Environmental Specialist
Navajo Superfund Office

SITE : Navajo- Nanabah Vandever Uranium Mine

EPA ID# : Not Assigned

1. SITE INFORMATION

SITE LOCATION: The abandoned Nanabah Vandever Uranium mine is located approximately four miles east northeast of Prewitt, New Mexico 87045 (Fig 1, Ref 1). Travel east on U.S. 66 frontage road from the Prewitt Post Office for approximately one mile. Turn north on an improved dirt road and go under the railroad. Take the second left (4 mi.). Go through the gate (no trespassing sign). The site is 0.75 miles from the gate on the south side of Haystack Mountain.(Fig.8) The site map location is T13N, R11W, Section 24.222 Bluewater Quad, New Mexico (1). Geographic coordinates for the site are 35° 20' 47" N latitude and 107° 57' 00" W longitude (1).

The mine is located on an expired mining claim approximately 1/4 section or 160 acres in size (40). The site itself is reported to be an open pit approximately 6 acres in size and 15-20 feet deep (23,24,27). Three different windshield surveys were conducted in the area, but no pit was found. It is possible the pit was filled in with waste from its own or adjacent mining activities. The waste piles are readily accessible (Fig. 4,5). This site is in close proximity to the Brown Vandever Mine site and several other abandoned uranium mine sites located on State lands (Fig.2).

OWNER AND OPERATOR: The Nanabah site is on an Indian Land Allotment issued to Nanabah Vandever in 1926 (41). The allotment, under the authority of the Bureau of Indian Affairs (BIA), has been probated to 31 heirs. Further information involves interaction with the heirs and the BIA (2). Currently, there is no operator. Past operators are listed under Section 2. The mineral rights belong to the current allotment owners (50).

PURPOSE OF INVESTIGATION: The Nanabah Vandever Uranium Mine was reported to be a potentially contaminated waste site by the Navajo Superfund Office field reconnaissance team in 1990.

BACKGROUND OPERATING HISTORY

The primary lease holders for the site were: 1952-54 Glen Williams; 1955-56 Santa Fe Uranium; 1955 Federal Uranium Corp., Santa Fe Uranium; 1956-57 Federal Uranium Corp.(26).

The site is in the Ambrosia Lake subdistrict of the Grants uranium district (25,27). No historical record of naturally occuring radiation levels for the area has survived to the present (47). As aforementioned, the site is recorded as being an open pit. It is presumed the mining operation was carried out using conventional mining techniques of drilling/blasting and front end loaders. Overburden and low-grade ore were dumped over the side of the outcrop onto the plain below (Figs.4,5).

The site produced 24,638 tons of ore containing 0.22% U_3O_8(Uranium) and 0.18% V_2O_5 (Vanadium). The milled ore yield was 115,075 lbs U_3O_8 and 85,545 lbs. V_2O_5 (26,27). The ore was transported to the Anaconda Mill in Bluewater, NM during the mining period (49).

KNOWN/POTENTIAL PROBLEMS/CONTAMINATES

The waste piles are suspected of producing surface and groundwater leachate and fugitive dusts containing toxic heavy metals and radionuclides. These possibly migrate onto grazing lands, into homes, and into two aquifers of concern(Fig.4, Ref.6,42). Leachable heavy metals including: Selenium, Lead, Arsenic, Barium, Molybdenum, Uranium, and Vanadium were found in an area ore analysis, and therefore suspected to be in the waste piles (29,30,33,34). Other suspected contaminates related to the waste piles are the radioactive uranium progenies: Radon, Radium, Bismuth, Thorium, and Polonium (28,31,32). The toxicities of these heavy metals and radionuclides are well documented (35,36,37,38,39).

The site has no containment, barriers, or warning signs, and is readily accessible to humans and animals (Fig.4,5). The nearest residence is 1/4 mile southwest of the site (Fig.6,8). As aforementioned, livestock graze at the base of the waste piles. The access road produced scintillometer readings of 100 mR/hr compared to a background of 6 mR/hr and $2.5X10^4$ CPM (11). The Navajo Superfund Office's Digilert (nuclear radiation monitor) set at 100 CPM sounded inside the closed reconnaissance vehicle near the site. There is no documentation of emergencies, accidents, or remedial actions related to the site.

3. WASTE CONTAINMENT/HAZARDOUS SUBSTANCE

The waste piles contain an estimated 208.52 tons of toxic compounds and elements dispersed throughout (8). There is no containment of these piles, and the potential for fugitive dust and leachate exists. The elements of major concern are: Uranium, Vanadium, Radium, Radon, Thorium, Bismuth, Polonium, Selenium, Lead, Arsenic, Barium, and Molybdenum (28,34).

4. PATHWAY CHARACTERISTICS

AIR PATHWAY: The potential migration for radon gas and fugitive dust containing toxic elements from the waste piles is high due to

the semi-arid nature of the area, the particulate nature of the waste, and the area's sporadic, southwesterly high winds.

GROUNDWATER PATHWAYS: Regionally, the site is bounded on the north by the Central San Juan Basin and on the south by the Zuni Uplift. The site is located on the Chaco Slope (43). The ore body was contained almost exclusively in the Jurassic, Todilto Limestone Outcrop (Fig.3 Ref.25,27,28). The Todilto is underlain by the Jurassic, Entrada Sandstone formation which contains the major of two aquifers of concern (3,22). The Entrada dips 4 degrees to the northeast in the direction of well #16T-521 (3,22). This formation is the aquifer source for well #16T-521 which is for stock water and possibly domestic use (16). It is also the artesian spring source 1/2 mile northwest from the site (Fig.8 Ref.1). The depth to water is 100 ft (22). The other aquifer for the site is the Upper Triassic, Sonsela Sandstone member of the Chinle formation which sources the tribal municipal well #16T-551 (12,16,22). The depth to water is 1000 ft. (16). The area is faulted with a hydraulic conductivity estimated to be 10^{-3}-10^{-5} cm/sec (3,13). The analysis of well #16T-551 in 1989 showed it to be in compliance for heavy metals and radionuclides (9). No radionuclide/heavy metal analysis records were avalible for stock wells. The net average annual precipitation for the site is -43 inches (18,19,20).

SURFACE WATER PATHWAYS: The site is located on an outcrop which is sloped 5 degrees to the north northeast (1). The waste piles set on the plain below the outcrop (Fig.4). The estimated upgradient drainage area is 23.7 acres (17). The drainage from the waste piles runs onto the plain following no visible channel, and appears to disperse over the plain (Fig.4). Therefore, there is no observable downstream drainage. The regional, 1-Yr, 24-hr. rainfall event for the site is 1.26 inches (45). A seasonal monsoon cloudburst is likely to carry leachate and particulates onto the plain.

ON SITE PATHWAY: The site has no barricades, containment, or warning signs. It is easily accessible by humans and animals. There are direct routes of ingestion and inhalation of particulates and Radon gas (45).

5. TARGETS

GROUNDWATER TARGETS: There are three active wells and one artesian spring within the 4 mile site radius (Fig.7 Ref.1,15,16). The Haystack Mountain community municipal water system and former stock well #16T-551 was developed by the Indian Health Service (IHS), and is currently operated by the tribe (12,16). The system serves approximately 500 people (1,5,12,14). The total population estimate for the area is 587 (1,5,12,14). It is assumed that people not connected to the water system may utilize it via family and/or friends. It is possible that approximately 85 area residents also utilize stock well #16T-521 or an artesian spring northwest of the site for domestic purposes (Fig.7,8). The stockwells and spring are related to the Entrada Sandstone formation which lies directly below the uranium-bearing Todilto Limestone, and is therefore

subject to leachate contamination of heavy metals and radionuclides.

SURFACE WATER TARGETS: There is no well defined drainage. Therefore, the primary targets would be the flora within the drainage area which could bioaccumulate contaminants to be ingested by grazing animals, and fauna which use any storm-related puddles as drinking water or wallows.

AIR TARGETS: The site waste piles are emitting Radon gas at an estimated 7.33 Curies/Yr (45). This far exceeds the 20 pico curie standard (46). It is estimated that 57 people live within 1/2 mile of the site; 52 of them downwind (1,5,12,14). The combined Radon emissions from this site and the adjacent abondoned mines pose an immediate danger to these people.

ONSITE TARGETS: None known. The possibility exists that the species listed under Sensitive Environments may be affected. Also livestock and people have unhindered access.

SENSITIVE ENVIRONMENTS: At least one federally designated sensitive environment lies within 1 mile of the site (21). Also, there are listed/potential-threatened/endangered fauna and flora species in the Haystack Mountain area (10). These are: Endangered Black Footed Ferret (Mustela nigripes), Burrowing Owl (Athene cunicularia), Mexican Free-tailed Bat (Tadarida brasiliensis), Mexican Spotted Owl (Strix occidentalis), Goshawk, Sharpshinned Hawk, and Rhizome Fleabane (Erigeron rhizomatus).

6.OTHER REGULATORY INVOLVEMENT

PERMITS : No permit was found for Nanabah Vandever mine site.

STATE AGENCIES: None (Ref.47)

OTHER FEDERAL PROGRAMS: None (50)

REMOVAL CONSIDERATIONS: None

7. CONCLUSIONS AND RECOMMENDATIONS

The Nanabah Vandever mine site is dangerous and threatening. Put into the perspective of combined effects with adjacent abandoned uranium mines, and a problem results that calls for immediate attention. It must be noted that there are numerous abandoned mines in the Haystack Mountain area many of which are not on tribal or allotment lands. There is evidence of human activity on the waste piles and possibly entering adits. Remedial action is warrented for those sites related to the Navajo Nation. Minimally, barricades and warnings should be placed around those sites unrelated to the Navajo Nation. Neither the Navajo nor New Mexico Abandoned Mine Lands Programs have addressed the problems related to the Haystack Mountain abandoned Uranium mines. Because these mines are in the "Checkerboard" area of tribal, state, and private lands, neither

agency wants to get involved. This has resulted in the area residents being subjected to prolonged exposures of toxic and carcinogenic elements.

Allotment owners, while not on tribal lands, receive services from the Navajo Nation through their local chapter. The requirement for these services is that they be registered voters with the Navajo Nation. Any services provided by the chapter such as water, electricity, housing, roads, etc. must first be approved by the Bureau of Indian Affairs local agent (50). This paragraph was deemed necessary to show the connection between allotment lands and the Navajo Nation.

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1. United States Geological Survey. 7.5 Minute Series Topographic Maps. Map collage of: Bluewater, NM 1957; Prewitt,NM 1963; Goat Mountain, NM 1957; Thoreau NE, NM 1963.

2. Contact Report
   To : Davy Morris, Director, BIA Reality
   From: Tom Morris, Environmental Specialist, Navajo Superfund Office.
   Re : Current ownership of site property.

3. Contact Report
   To : Patrick Antonio, Hydrogeologist, Navajo Superfund Office
   From: T. Morris, Environmental Spec., Navajo Superfund Office
   Re : Groundwater contamination potential, Haystack Mountain

4. Contact Report
   To : Daryll Begay, Ranger, Navajo Fish and Wildlife
   From: T. Morris, Environmental Spec., Navajo Superfund Office
   Re : Fisheries, recreational areas, Haystack Mountain

5. Contact Report
   To : Elsie Brown, Field Nurse, Indian Health Service
   From: T. Morris, Environmental Spec., Navajo Superfund Office
   Re : Current residence count, Haystack Mountain

6. Contact Report
   To : Davad Baggett, Environmental Specialist, New Mexico Health and Environment Department
   From: T. Morris, Environmental Spec., Navajo Superfund Office
   Re : " Bioaccumulation of Radionuclides in Cattle Raised Near Uranium Mines and Mills in Northwest New Mexico".

7. Contact Report
   To : Patrick Antonio, Hydrogeologist, Navajo Superfund Office
   From: T. Morris, Environmental Spec., Navajo Superfund Office
   Re : Flood plain, sole source aquifer, Haystack Mountain

8. Contact Report
   To : Patrick Molloy, Health Physicist, Navajo Superfund Office
   From: T. Morris, Environmental Spec., Navajo Superfund Office
   Re : Waste volume calculation, Nanabah Vandever site

9. Contact Report
   To : Christopher Mike, ASO1, Navajo Water Development
   From: T. Morris, Environmental Spec., Navajo Superfund Office
   Re : Community water well analysis, Haystack Mountain

10 Contact Report
   To : Yolanda Barney, Data Mgr., Navajo Heritage Program
   From: T. Morris, Environmental Spec., Navajo Superfund Office
   Re : Threatened and Endangered species, Haystack Mountain

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24. New Mexico Bureau of Mines and MIneral Resources. Open File Report 183. Fig. 11. "Uranium Ore Deposits and Mines in the Ambrosia Lake Subdistrict, Grants Uranium District, McKinley and Cibola Counties, New Mexico". Compiled by V.T. McLemore. 1980-82

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Reference". Van Nostrand Reinhold, 115 Fifth Av., New York, NY 10003.

40. Contact Report
To : Rich Koch, Geologist, Navajo Minerals
From: Pat Molloy, Health Physicist, Navajo Superfund Office
Re : Leases, Navajo Uranium Mines

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45. Contact Report
To : P. Molloy, Health Physicist, Navajo Superfund Office
From: T. Morris, Environmental Spec., Navajo Superfund Office
Re : Waste pile Radon emissions calculations, Nanabah Vandever

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47. Contact Report
To : Mike BuMvnd, New Mexico Abandoned Mine Lands
From: T. Morris, Environmental Spec., Navajo Superfund Office
Re : Abandoned Uranium Mines, Haystack Mountain

48. Contact Report
To : Martin Begay, Director, Navajo Abandoned Mine Lands
From: T. Morris, Environmental Spec., Navajo Superfund Office
Re : Abandoned Uranium Mines, Haystack Mountain

49. Chenoweth, W.L., 1977. "Uranium in the San Juan Basin-An Overview". New Mexico Geological Society Guidebook, 28th Field Conference. p.257-262.

50. Contact Report
To : Ervin Mariano, BIA Realty
From: T.Morris, Environmental Spec., Navajo Superfund Office
Re : Allotment owners connection with the Navajo Nation

REFERENCE 8

Ket 8 RME-172
R.J. Holmquist

SILVER SPUR Section 31, 14-10

Section 31 was granted to the Santa Fe Railroad and then sold to W.A. Berryhill in 1946. The section was then leased to Duane Berryhill and L. Elkins in 1952. The grant from the U.S. Government was vague on whether the grant included the mineral rights but it was later determined that the mineral rights, except coal, oil and gas were a part of the grant.

Exploration drilling started in late 1953 and several small ore pods were found. In Jan. 1955, 45 holes had been reported drilled with three of them in ore. In April 1955 Holly Uranium Co. did some rim stripping with more drilling planned. After a few shipments of ore and more drilling the property was turned back to the owners. In Dec. 1956 Farris Bros took a lease and started a new adit from the rim and found a limited tonnage of good ore. Production continued from Sept. 1958 until May 1959 when the mine was closed.

Total production was 5930 tons of .25% ore.

* Total development estimate as submitted by Febco Mines.

** Patented section owned by Fanny Mae Berryhill. Leased to Laurence Elkins and Duane Berryhill (Silver Spur Mining Co.) in 1951. Subleased to Holly Minerals in 1952. Holly dropped their lease in 1956. Febco Mines subleased from Elkins and Berryhill in 1956. Febco Mines still controlled the property as of 4/1/60.

REFERENCE 9

Ref 7

Record of Communication
March 25, 1991
09:15

I spoke with Ritha Duffey, from the Assessors Office of McKinley County (in Gallup) regarding the ownership of property at T 14N, R 10W, S 31. Ritha told me that the entire section is private property & the owner is Berry Hill.

Linda Pluk

REFERENCE 10

Ref. 10

Sarah Ortiz
Assessor
assessor1@co.mckinley.nm.us

Phillip Gutierrez
Chief Appraiser
p.gutierrez@co.mckinley.nm.us

Office of the Assessor
207 West Hill, Suite # 102
Gallup, New Mexico 87301
505-863-3032 * Fax 505-863-6517

FAX

To: Robin Brown **Fax:** 505-827-2965

From: Juanita **Date:** 8-5-05

Re: Ownership **Pages:** 4

CC:

☐ Urgent ☐ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

Comments: Found only 1 owner and see attached notes on the other two. Let me know if you have any questions. Have a good day!

J

<-- --> ☐ Cancel

Owner Name/Address

STR 14 10 Mill Levy 32.233000 ☐ AFIC

Account	R052582
Year	2005
District	221
VET ID	
St	A

N ELKINS, DAVE P.
REV. TRUST
P.O. BOX 62
GRANTS NM 87020-0000

Legal Description L

SEC'S 19 & 31 14 10/ SEC'S 1,11,13 & 25,14 11, SE1/4NE1/4 OF 10 14 11, E1/2 14 14 11, ALL EXCEPT NW1/4NW1/4 OF 35 15 11, 4800 ACRES M/L D.B.28-527 BK 6 PGS 8224-28 08/23/93 BK PG 479 3/8/00 BK 20 PG 7846 7/16/03 CODE #2-062-082-132- RSJFCD

Parcel Number	MH Space	Seq
2-062-082-132-396		

Street No	Dir	Street Name	Type	No#

Location City	Location Zip	Acct Type	Last
NORTH OF PREWITT			

BACode	Owner Id	Owner Location	Map No

Business Name

Version	V. Date	Time	ID	Appl	New Version
[illegible]	[illegible]	[illegible] AM	[illegible]	[illegible]	20050805000

☒ Name	☒ Tax Items	☐ Protest (T)	☐ CAMA (A)
☐ Situs	☐ Pre/Suc	☐ Mobile Auth	☐ Permit
☐ Mobile	☒ Remarks	☐ Value	☐ Personal (P
☐ Tract	☐ Tax Sale	☐ State Asd	☐ Oil and Gas
☐ Condo	☐ Spc Asmt	☐ Control	☐ Recording
☐ Block	☐ Mines	☐ History	☐ Imaging
☐ Sales	☐ Sibling		☐ Photo
☒ Misc (M	☐ Flags	☐ Exemptio	☐ Sketch
☐ Mail Trk	☐ Tax Chg	☐ Mtg Track	☐ Acct Chg

TYPE	ACTUAL	ASSD	ACRES	SQ FT
LAND	5,040	5,040		
LIVESTOCK	171,790	57,260	0.000	
TOTAL	176,830	62,300	0.000	

Queries

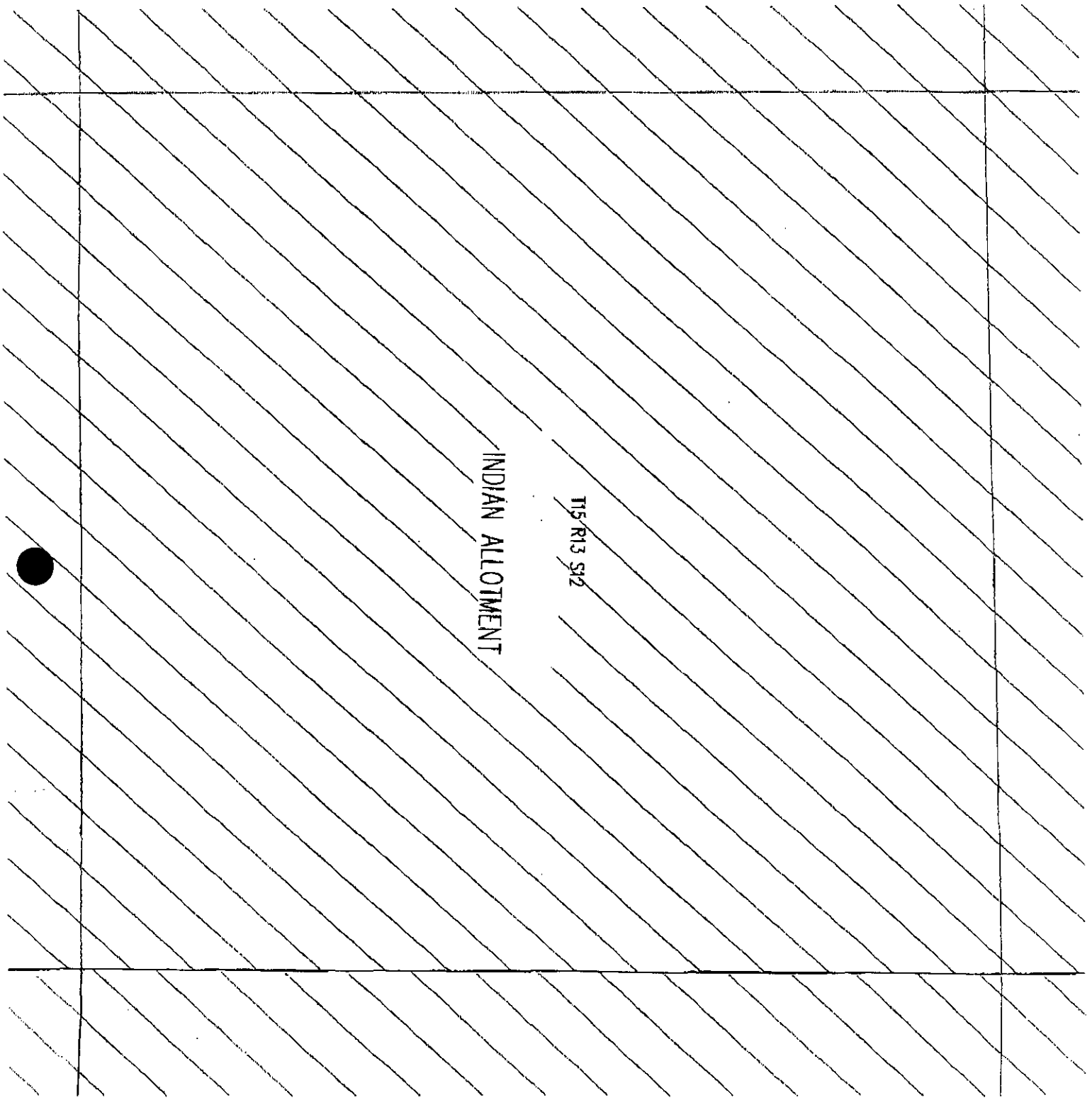
ACCOUNT

Current Year	Prior Version	Tax Trx
Prior Year	Ne(x)t Version	Abatement
Next Year	Characteristics	Property Card
Update	Clear	Exit

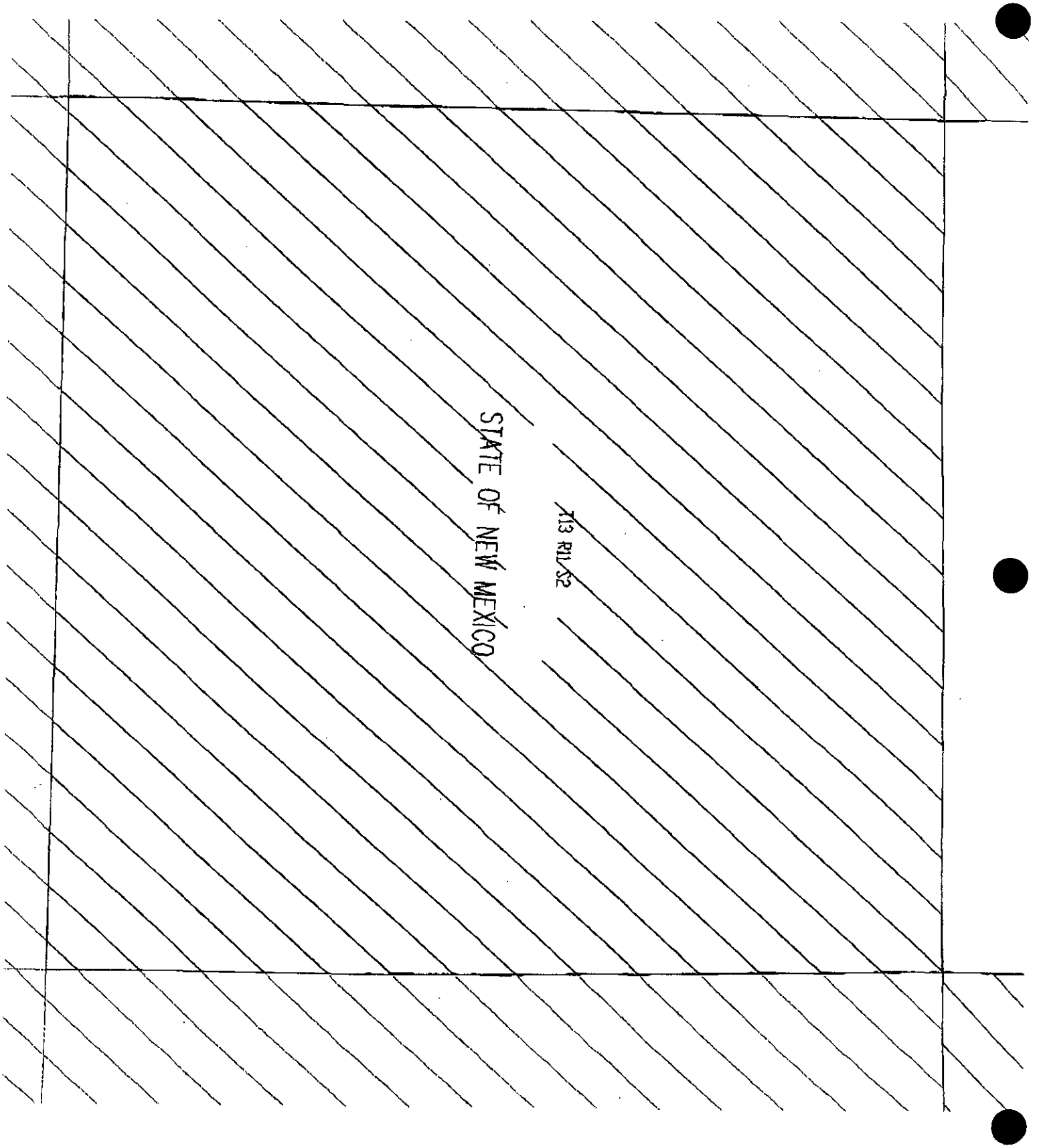
Value Sum

* Owner of property T14 N R10 W Sec 31
You will find all of the Book and Pages
in the legal description

* Need to contact Bessie with Indian Allotment Land at (505) 786-6129 - Eastern Agency.



* Property belongs to State of New Mexico *



REFERENCE 11

T. 14 N, R 10 W, Section 31 Ref 11

Date visited 12/13/79

Mine name(s) Febco (Small Stake) County McKinley

Section S½, SW¼ 31 Twnsh. 14 N R. 10 W

Quadrangle sheet Goat Mountain 7½'

Mining district Grants

Elevation 7,200'

Nearest city and/or dwellings Single family dwellings, 1½ mile S

The mine is located on the north side of small east-west trending drainage line near the south line of sec. 31. It may be reached via the road leading northward from the east side of Haystack Mountain. Proceed northward on this road for approximately 3 3/4 miles; road passes through gate at the sec. 6-sec. 31 line and mine will be visible at that point.

The workings consist of a series of 4 adits driven northward into a coaly carbonaceous, shale zone in basal Dakota sandstone. The westernmost is the largest (photo a) with a 6' x 6' portal; timbering is visible just inside, but adit was not entered. Caving or bulldozing has partially blocked the portal, but with a little effort a man could enter.

The next 3 adits seem to get progressively smaller as indicated by the size of the tailings dumps below them, but caving, or blasting to seal, has blocked the adits to the extent that no one can enter. The 2nd through 4th adits are shown in photos (b) thru (d). Scintillometer readings near the portals of the adits ran to 350 cps. Tailings dumps, shown in photo (e), produced readings of 1,200 cps for largest (westernmost) dump, 800 cps for smaller dumps. Larger dump is about 60' high (see photo f) and fans out to more than 200' wide at the toe.

Mine was opened in 1952 and operated by Febco Mines, Inc. Total period of operation is not known, however, production through July 1, 1958 was listed as 3,912 tons of ore averaging .27% U_3O_8 (AEC PED-1).

References: (1) Hilpert, L., 1969, Uranium Resources of NW New Mexico, U.S.G.S., Prof. Paper 603.
(2) U.S. AEC PED-1, 1959, Mine Operation Data Report, GJO/AEC, p. 65; (microfiche only).
(3) Hilpert, L., 1969, Uranium, in Mineral and Water Resources of New Mexico: New Mexico Bur. of Mines and Mineral Resources, Bull. 87, p. 218.
(4) Field notes, 12/13/79.

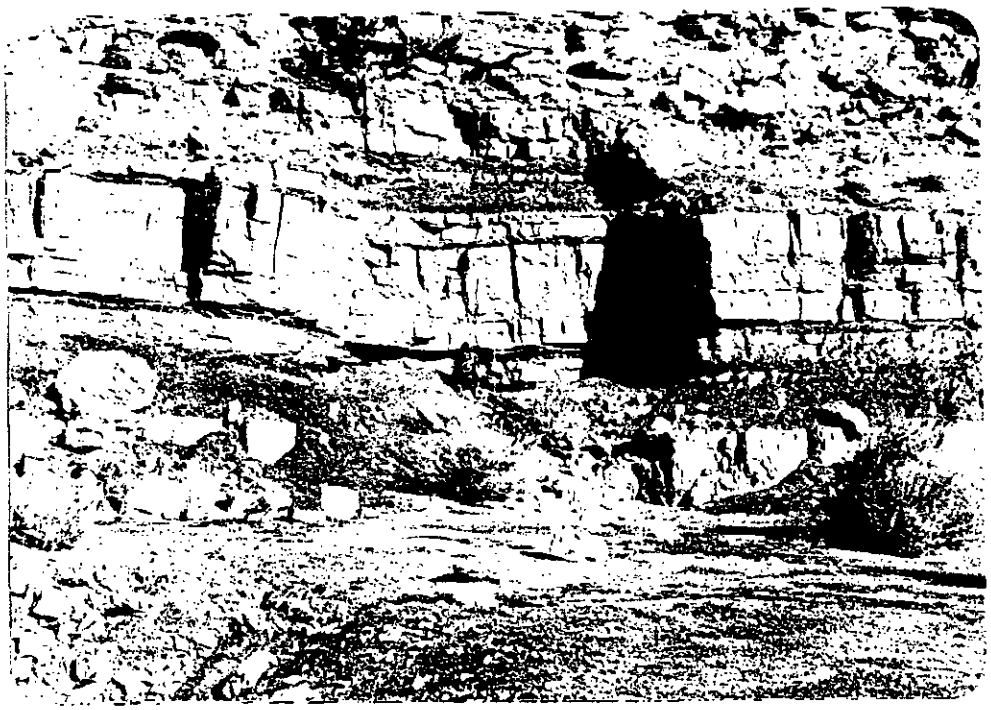


Photo (a) Looking northward at partially caved entrance to westernmost adit at the Febco Mine.

Photo (b) Looking northward at caved entrance to second adit (going eastward) in series of four.

Photo (c) Looking northwestward at caved entrance to third adit in series (going eastward).

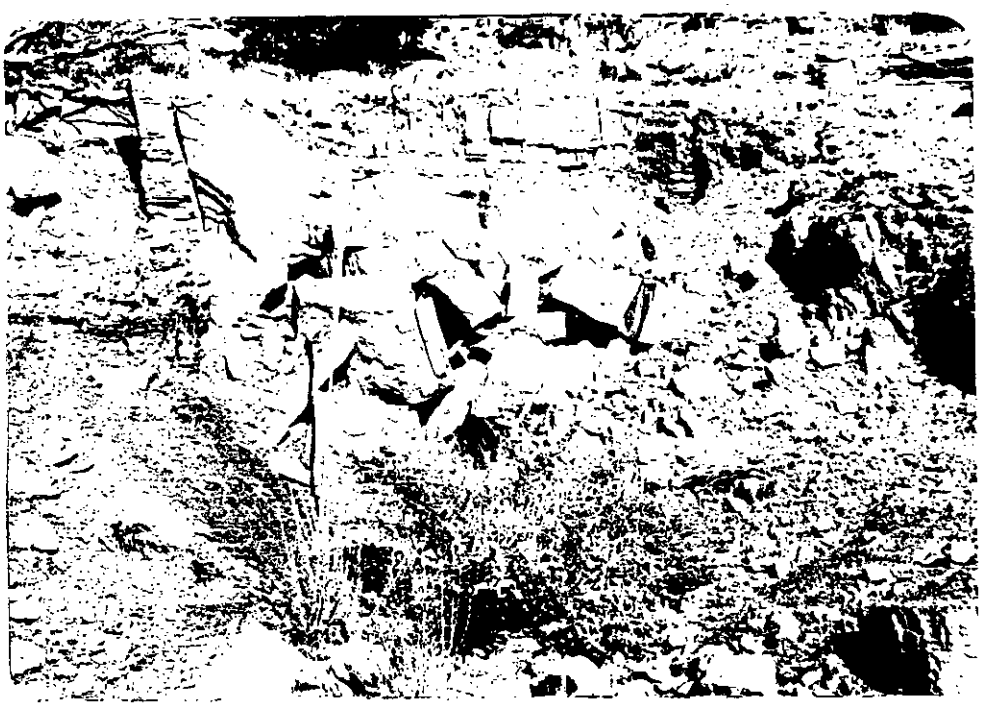


Photo (d) Looking northward at caved entrance to fourth adit (easternmost) in series of four.

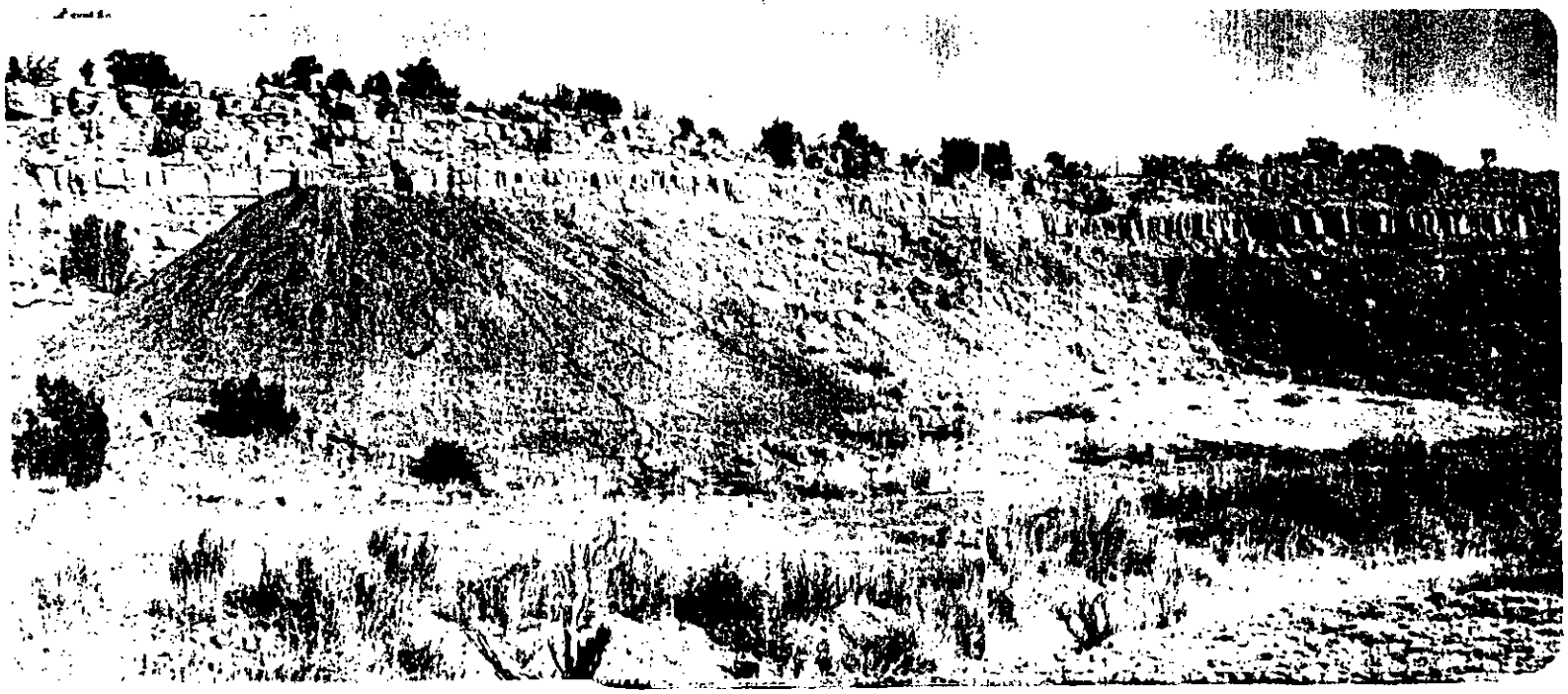


Photo (e) Looking north-northeastward at Febco Mines showing tailings dump from largest adit at left, and the coalesced tailings dumps from the other 3 adits at right. Dump at left is 60' high, but is spread thinly. (For close-up see photo (f)).

REFERENCE 12

Ref 12

THE NAVAJO NATION

LEONARD HASKIE
INTERIM CHAIRMAN
THE NAVAJO TRIBAL COUNCIL

IRVING BILLY
INTERIM VICE CHAIRMAN
THE NAVAJO TRIBAL COUNCIL

29 May 1990

Steve Cary; program manager
Hazardous Waste Section
Environmental Improvement Division
1190 St. Francis Road
Santa Fe, New Mexico 87503

Dear Mr. Cary

Pursuant to the discussion on Febco Uranium Mine Site with you and Ms. Susan Morris, I am enclosing the general preliminary assessment for your information. I hope, we can continue to work on the site and eventually clean-up the site. I have great concern for the health and welfare of the Navajo Residents in proximity of the site.

Again, respectfully, I recommend the New Mexico State Superfund to investigate the site and respectfully keep the Navajo Superfund inform of the progress. If you need more information please contact us.

Thank you for your time and action.

Sincerely,

Lee V. Bigwater
Reclamation Specialist II

16 May 1990

M-E-M-O-R-A-N-D-U-M

To : Clara Bia
Navajo Superfund Office

From : Lee V. Bigwater; Reclamation Sp. II
Navajo Superfund Office

Subject: Febco Uranium Mine

This particular abandoned uranium mine (Febco Mine) is located approximately 2 1/2 miles north of the Haystack Mountain. More specifically, the abandoned mine is in Township 14 North, Range 10 West, Section 31.

I have worked on the preliminary assessment for the mine and completed about 3/4 of the PA research. In the processes, I encountered the land status problem and started contacting various land agencies. Base on the BIA Realty Office, Navajo Land Administration and the Mckinley County Assessor Office, the Section mentioned above is leased out to Mr. A.M. Berryhill of 7000 West Highway 66, Bluewater, New Mexico 87005. The telephone # is (505) 287-2813. I have confirmed the land status of section 31 by contacting Mr. Berryhill at his Grants, New Mexico resident.

Due to the close proximity of the uranium mine to the Navajo residents, the mine is a potential hazard and other means of providing remedial action should be taken. See the attached map for proximity of the mine and residents. I have contacted Steve Cary of New Mexico State Superfund Office in Santa Fe and he is going to make a follow-up to check if the mine is on their PA listing. Mr. Cary will be contacting our office for further information. I recommend, on behalf of our Navajo residents within Baca Chapter, we establish a sound working relationship with New Mexico State Superfund Office and provide every possible action for the remediation of the site.

If you have any question please contact me. Thank you for your time and action.

PRELIMINARY ASSESSMENT

Date : 7 May 1990

Prepared : Lee V. Bigwater
Navajo Superfund Office
P.O. Box # 2946
Window Rock, Arizona 86515

Site : Febco Uranium Mine
Mckinley County, New Mexico

EPA ID # :

1. Site Information

A. Location

The Febco Uranium Mine is located approximately 2 1/2 miles north of Haystack Mountain (figure # 1). The site is readily accessible via Interstate Highway 40 and turn off at exit 63, then preceed on to the frontage road on the northside of the Interstate Road for about 2 miles eastbound and turn off on community road toward northeast which leads into the Haystack community. The geographic coordinates for the site are 35' 23' 40" latittude and 107' 56' 10" longitude (refecence #).

The site is located in the Grants Uranium Belt area, a semi-arid rangeland on the Navajo Reservation (figure # 1 and figure # 2). The map indicates three adits, but only one is visible, which is at the west end of the property. There are three wastepiles within the site (reference #).

B. Owners and Operators

The Febco Uranium Mine is currently owned, and was owned throughout its mining history, by _____. The Land is alloted to _____ .

The mine was owned and operated by several companies, which were O.J. Anderson in 1980; Green and Others in 1980; Pierson and Green in 1977; Hilpert in 1969; Theden and Others in 1963; Mirsky in 1958; and PRR GIEB-R-172 in 1952 (reference #).

C. Purpose for Investigation

The Chapter President; Fred James reported the concern of numerous abandoned uranium mine within his chapter area. (reference #) After the investigation Navajo Superfund Office determined the Febco Uranium Mine site was a potentially contaminated waste site.

2. Background/Operating History

A. Site History

The Febco Uranium Mine is located in the Ambrosia Lake Subdistrict (reference #). The site was mined using a combination of conventional blasting coupled with hand labor for the removal of cobble, slag, and fines from the adits. The ore was graded by hand and the slag was deposited in the waste piles down on the slope, on the site (reference #).The adits are driven to the mesa cliffs composed of the host rock Cretaceous, Dakota Sandstone. The uranium tailing piles are located adjacent to drainages that lead to area wells and agrricultural fields (reference #). The ore was presumably transported off-site for purchase and milling in tha Amaconda Bluewater Milling in Grants, New Mexico.(Personal contact with Benjamin Lewis of Haystack Community. He was the Ore Transporter in 1960's and reference # 2).

Mining operations at the the Febco Uranium Mine ore production is not recorded and not known, due to the small stake mining operation (reference # 5).

B. Disscussion of known/Potential Problems

The site is unfenced and the one open adit is accessible to the rural residents. The site is in a box canyon (reference #).

There is no documentation concerning emergencies, accidents, or remedial action regarding the Febco Uranium Mine.

Mr. Benjamin Lewis mention a woman, age late 60's whom live in the area all her life has a lung problem.

3. Waste Containment/Hazardous Substance Substance Identification

The _____ tons of toxic compounds dessiminated within the _____ total tons of mining waste present on-site are exposed, uncontained and are therefore capable of producing leachate subject to migration into atmospheric, groundwater, and surface water systems reference #).

Specific radioactive species contributing to contamination of the leachate are uranium (U234, U238), and its daughter products (R226, Th, isotopes of Pb, B214, etc) (reference #). Toxic heavy metal species suspected of being present in the mining waste in significant concentrations are arsenic and selenium (reference #).

There is no restrictions or barriers on accessibility to onsite waste materials. It has been indicated children play on the site and use the waste material as a slide (personal contact).

4. Pathway Characterization

A. Air Characteristics

The potential for mobility of hazardous and toxic compounds associated with U3O8 and V2O5 mining waste is high due to the particulate nature of the waste and the occasionally high winds native to the area which may cause mitgration of windblown contaminants on and offsite. A scintillometer reading collected above background for the area indicates that radioactive species are present on-site and may be contributing to the migration of windblown contaminants (reference #).

B. Groundwater Characteristics

Regionally, the site is bounded on the Chaco Slope within the southeast section of the San Juan Basin and immediately to the east by Mount Taylor. The outcrop of Jurassic rocks, which stretch from Gallup, New Mexico to Grants, New Mexico is lain on the south of the site (reference # 2). The geologic and hydrogeologic units underlying the site composes of the Brushy Basin member, Westwater Canyon member, and Recapture member of the Morrison Formation. The Statigraphic correlations in the San Juan Basin underlying the Morrison Formation composes of the Bluff Sandstone, Summerville Formation, Todilto Limestone, Entrada Sandstone and the Chinle Formation (triassic) (reference # 6). The net precipitation in the area range from _____ inches to_____inches per year (reference #). The drainage area from the site is the tributary of the Rio San Jose Creek, which is the tributary of the greater Rio Grande River. At the gaging station (3435) on the Rio San Jose Creek has an average discharge 2.97 cubic feet per second and 2,150 acre feet per year.

The aquifer of concern in the immediate vicinity of the site is the Entrada Sandstone Formation of Jurassic age in the San Juan Basin drainage area (reference # 9). This aquifer serve the local livestocks and demestic uses. Windmill # 16T-552 was converted to demestic uses by the Navajo Tribal Utility Authority which serves about 86 houses in the 4 miles radius of the site. The depth to this aquifer is _____.

Contaminants of concern present in the mining waste are uranium, radium, thorium, vanadium, arsenic, and selenium (reference #). All of these species have been demonstrated by various investigators to be mobile in waters associated with uranium mines (refernce #). The possibility therefore exists for these radioactive and toxic heavy metals species to have migrated down to the earthen dam, which is aproximately less than one mile southeast fron the site (refernce #).

C. Surface water Characteristics

REFERENCE 13

Post-It™ brand fax transmittal memo 7671 | # of pages ▸ 9

To Dana Bahar	From Eugene Esplain
Co. NM GWQB-505	Co. NNEPA
Dept.	Phone # 928-871-7331
Fax # 505-827-2965	Fax #

Ref 13

GROUND WATER

MAR 2 0 2006

BUREAU

Abbreviated Preliminary Assessment Report

Site : Febco Uranium Mine
Prewitt, McKinley County, NM

Site EPA ID Number: NND986669166

Submitted to: Jeffery S. Inglis, USEPA Project Officer
75 Hawthorne Street (SFD-5)
USEPA EPA Region IX
San Francisco, CA

Date: May 7, 2001

Prepared by: Novik D. Begay, ESI
Navajo Superfund Program
Navajo Nation Environmental Protection Agency

Review and Concurrence: Stanley Edison, Chemist/ Team Leader
NSP
George Padilla, Program Manager
NSP

1.0 INTRODUCTION

Under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), who has tasked the Navajo Nation Environmental Protection Agency's Superfund Program (NSP) to conduct an Abridged Preliminary Assessment (APA) of the Febco Uranium Mine (hereafter "site")

The purpose of the APA is to review existing information on the site and its environs to assess the threat(s), if any, posed to public health, welfare, or the environment and to determine if further investigation under CERCLA/SARA is warranted. The scope of the APA includes the review of information available from federal, state, and local agencies and performance of an on-site reconnaissance visit.

Using these sources of existing information, the site is then evaluated using the U.S. Environmental Protection Agency's (USEPA) Hazard Ranking System (HRS) criteria to assess the relative threat associated with actual or potential releases of hazardous substances at the site. The HRS has been adapted by the USEPA to help set priorities for further evaluation and eventual remedial action at hazardous waste sites. The HRS is the primary method of determining a site's eligibility for placement on the National Priorities List (NPL). The NPL identifies sites at which the USEPA may conduct remedial response actions. This report summarizes the findings of the APA investigative activities at the site.

The site was identified as a potential hazardous waste site by the Navajo Nation Environmental Protection Agency and entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database on July 16, 1991. The site was entered into CERCLIS based on a referral from NNEPA (formerly known as the Navajo Environmental Protection Administration).

1.1 Apparent Problem

The apparent problems at the site are as follows:

- The site was an abandoned uranium mine. Past mining activities at the site extracted high grade uranium ore that was transported off-site for further processing. Low grade radioactive uranium ore along with mine waste were disposed of on-site.
- The site was extensively mined over a 14- year period
- Mine waste was disposed of onsite into unlined and open areas.
- Mine waste is unstablized and uncapped.
- Radioactive and heavy metal contaminants in the mine waste piles have the potential to migrate via ground water and surface water pathways.
- Surface water runoff has transported mine waste materials into the nearby arroyo which flows from west to east.

The site is accessible to livestock and nearby residents.

2.0 SITE DESCRIPTION

2.1 Location

The site is located approximately 11 miles northeast of Prewitt, McKinley County, New Mexico. The site can be accessed by traveling east on U.S. Highway 66 for 2.7 miles from the Prewitt Post Office. Turn north on a graded dirt road that goes underneath the railroad tracks, and travel northeast for approximately 9 miles to an east-west trending fence. This fence separates the Navajo Indian Allotted Lands and New Mexico State lands. The site is located approximately 350 yards north of the fence entrance. The site's geographic coordinates are 35°23'35.41" north latitude and 108°01'18.63" west longitude, at Township 14 North, Range 10 West, Section 31 S1/2, SW 1/4. The topographic maps of the site area include Goat Mountain, NM 1980, Thoreau NE, NM, 1980; Ambrosia Lake, NM, 1980, and Bluewater, NM 1980. The regional site location is shown in Figure 2-1.

2.2 Site Description

The site is located in the Grants-Ambrosia Lake District of the Grants Mineral Belt. Currently, site is comprised of three adits (horizontal passages from the mine surfaces). All the adits are sunk into the side of a rocky hill composed of the Dakota Sandstone outcrop. The uranium ore was extracted and separated on site, the high grade ore was transported off-site for further processing while the low grade ore and mine overburden was disposed of on-site. The low grade ore and mine waste was strewn over the side of the outcropping. There are two large mine waste piles that are unlined, uncapped and unstablized. The site location is shown in Figure 2-2. It is reported that the combined mine waste volume is estimated to be 5,035 cubic yards to be on-site.

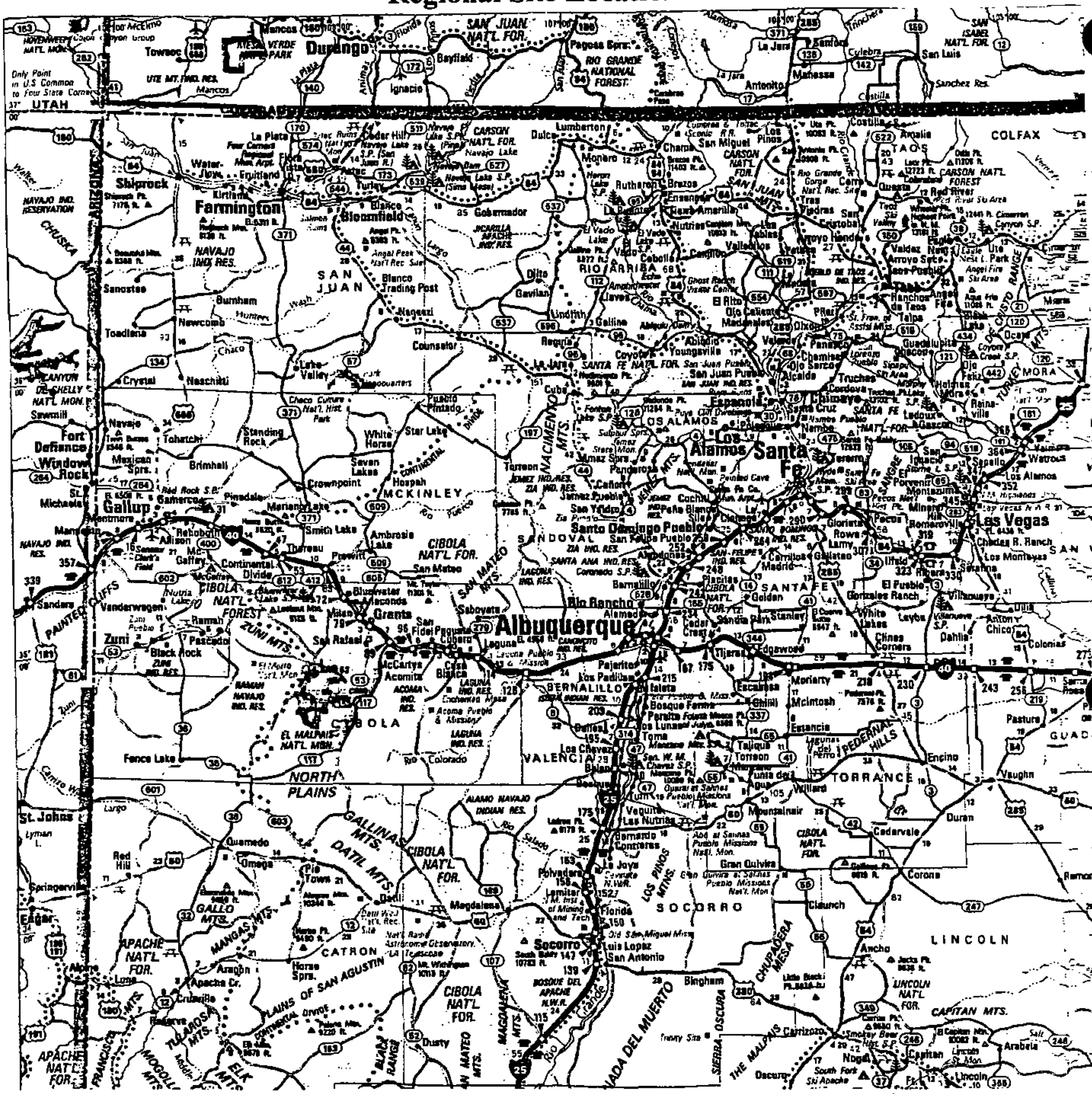
The site occupies approximately 30 acres in a rural area. The site is bordered on the north by Mesa Redondo, on the west by Goat Mountain, on the south by Haystack Mountain, and on the east by Mesa Montanosa.

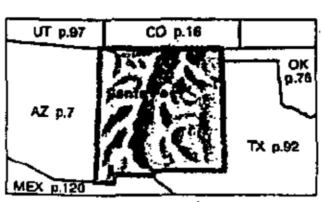
The overall climate is semi-arid and subject to periodic summer rain storms and flash floods. The site vegetation is predominantly sparse grasses, brushes and forbes. The prevailing wind is from the west, and the winds of the high velocity are generally from the west-southwest.

3.0 Preliminary Assessment Activities

Initial Preliminary Assessment activities conducted for the site included data collection regarding site location, ownership, present and past occupants, chemicals, if used on-site and governmental agency involvement. There are currently no known regulatory agencies, federal or state, involved with the site.

Figure 2-1
Regional Site Location





N

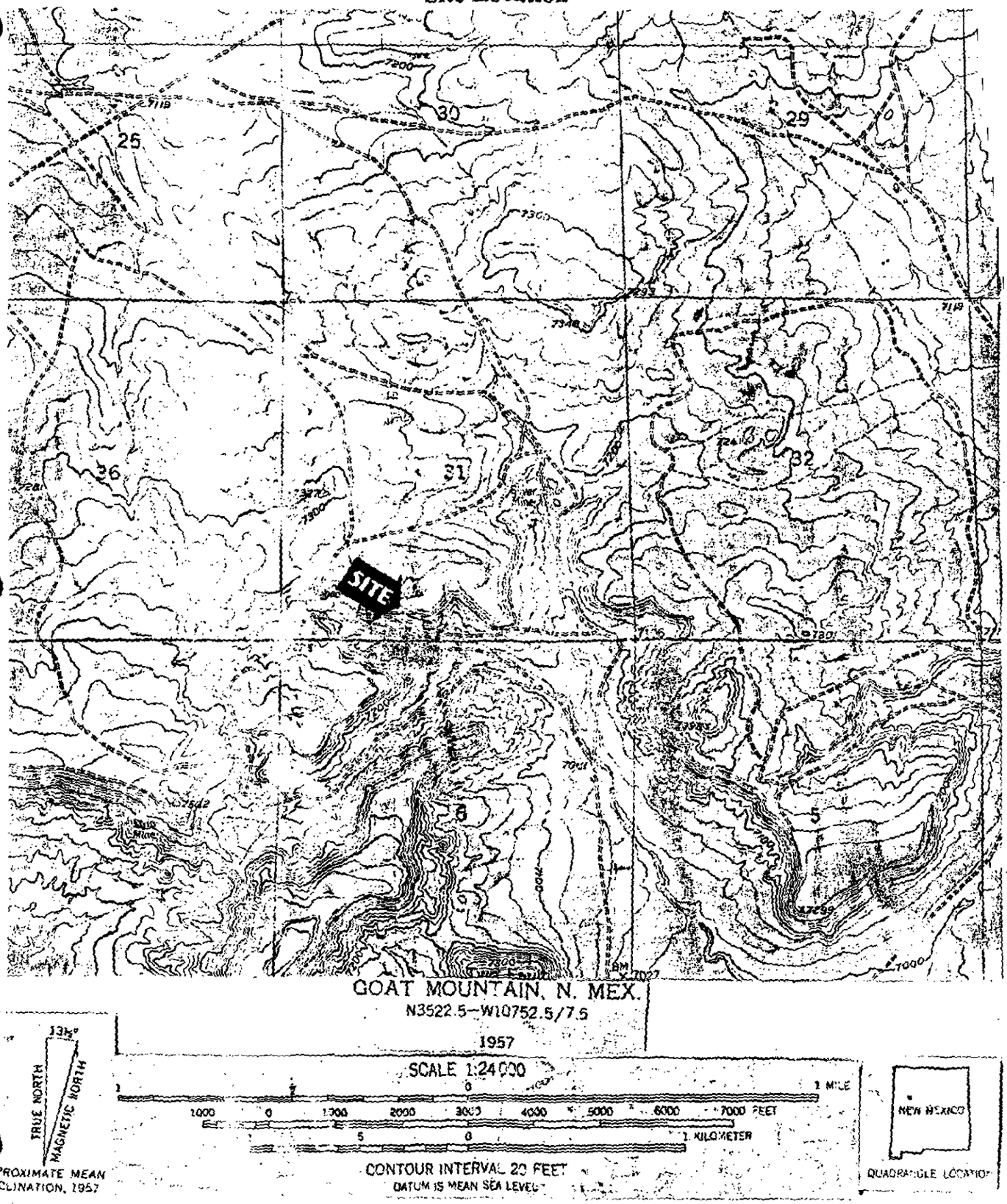
How to Determine Distance

0 10 20 30 Mi

0 10 20 30 40 Km

Mileages in red between red arrowheads; in black, between intersections.

Figure 2-2
Site Location



The site produced approximately 5,035 cubic yards of radioactive mine waste that was disposed of on-site. The site operations began in 1952, the total period of operation is unknown. However, the site production records indicate site operations from 1952 to 1958. The site is located on land granted to the Santa Fe Railroad from the U.S. Government. The land grant with the minerals rights were sold to W.A. Berryhill in 1946, who then leased the property to Duane Berryhill and L. Elkins in 1952. There are no records indicating mine operators.

4.0 HAZARD RANKING SYSTEM FACTORS

4.1 Sources of Contamination

The hazardous substances of concern at the site are radionuclides and heavy metals present in the mine waste and within the adits. The mine waste is unlined, uncapped and unstabilized. The potential exists for the migration of radionuclides and heavy metals into local groundwater and surface water routes.

4.2 Groundwater Pathway

The site is located on the Dakota Sandstone, which is approximately 75 to 100 feet thick. The groundwater of the site area is sourced by four units: the Upper Triassaic Sonsela Sandstone Member of the Chinle Formation, the Jurassic Entrada Sandstone Formation, the Jurassic Westwater Canyon Sandstone of the Morrision Formation, and the Cretaceous Dakota Sandstone. Each of these units yield small amounts of water to domestic and livestock water wells in the Grants area.

At the site area, the aquifer of concern is the Sonsela Sandstone Member of the Chinle Formation which serves the Navajo Nation municipal water well 16T-551. This well is located 3.5 miles south of the site, and is drilled to 1000 feet. The water analysis records from 1989 indicate the well is in compliance with drinking water standards. The water well 16T-521 located 2.2 miles south of site and is drilled to 100 feet. This well is used for livestock and possibly for domestic purposes. Another water well is located 1.3 miles southeast of the site, but no information is currently available. There are no sample analysis records available for the livestock wells. ← 16B-38

It is estimated that the hazardous substance of concern from the site will not impact the local groundwater table located at the 1000 feet below the ground surface. The groundwater flow of direction in the site vicinity is towards the northeast away from the water wells.

4.3 Surface Water Pathway

The site is located at the headwaters of an east-west trending drainage. The intermittent drainage turns south of the mine, and downstream the two livestock wells and the

municipal water are located within this drainage area. The drainage areas downstream of the mine are used for irrigation of agricultural fields. There are no known surface water intakes located within 15 miles downstream of the site. There are several Federally designated or proposed endangered or threatened species within 4 miles of the site. The species are the following: Endangered Black Footed Ferret (Mustels nigripes), Burrowing Owl (Athene cunicularia), Owl (Strix occidentialis), Goshawk Sharpshinned Hawk and Rhizome Fleabane (Erigeron rhizomatus).

There are no drinking water targets downstream of the site.

4.4 Soil and Air Pathway

The on-site soils at the adit and mine waste piles are contaminated with radionuclides and heavy metals. The site is easily accessible to the public, there is no fence or barriers restricting access. These areas are livestock grazing areas.

There are no on-site residences, day-care centers, or sensitive environments within 200 feet or 1/2 mile of the site.

The prevailing winds is from the west, and the winds of the highest velocity are generally from the west-southwest. The potential for airborne migration of particles and radon gas is high due to seasonal high winds.

The Haystack community is located 4 miles south of the site, and the nearest resident lives about 3/4 miles from the site. Approximately 500 persons live within radius of the site. Most of the residences are not directly downwind of the site.

5.0 Emergency Response Considerations.

The National Contingency Plan [40 CFR 300.415(b)(2)] authorizes the EPA to consider emergency response actions at those sites which pose an imminent threat to human health or the environment. For the following reasons a referral to Region IX's Emergency Response Section does not appear to be necessary:

- Site is located in a remote place
- No imminent risk or threat to nearby population
- There are no residences, schools, or daycare centers located on the lease properties, or located within 200 feet of contamination associated with the site.
- Area drinking water is located at 1000 feet below ground surface.

6.0 Summary

The activities conducted for the site included data collection regarding site location, ownership, site history. The site is located on state land northeast of Prewitt, McKinley County, New Mexico.

The land grant with the minerals rights were sold to W.A. Berryhill in 1946, who then leased the property to Duane Berryhill and L. Elkins in 1952. The site operations began on 1952 and ceased in 1958. Currently, the site is comprised of three adits (horizontal passages from the mine surfaces). All the adits are sunk into the side of a rocky hill composed of the Dakota Sandstone outcrop. The mining activities included open slopes with random pillars using a rackless haulage. The uranium ore was extracted and separated on site, the high grade ore was transported off-site for further processing while the low grade ore and mine overburden was disposed of on-site. The low grade ore and mine waste was strewn over the side of the outcropping. There are two large mine waste piles that are unlined, uncapped and unstablized. The site location is shown in Figure 2-2. It is reported that the waste volume is estimated to be 5,036 cubic yards of waste on site.

The hazardous substances of concern at the site are radionuclides and heavy metals present in the mine waste and within the adits. The mine waste is unlined, uncapped and unstabilized. The potential exists for the migration of radionuclides and heavy metals into local groundwater and surface water routes.

At the site area, the aquifer of concern is the Sonsela Sandstone Member of the Chinle Formation which serves the Navajo Nation municipal water well 16T-551. This well is located 3.5 miles south of the site, and is drilled to 1000 feet. The water analysis records from 1989 indicate the well is in compliance with drinking water standards. The water well 16T-521 located 2.2 miles south of site and is drilled to 100 feet. This well is used for livestock and possibly for domestic purposes. Another water well is located 1.3 miles Southeast of the site, but no information is currently available. There are no sample analysis records available for the livestock wells.

The drainage areas downstream of the mine are used for irrigation of agricultural fields. There are no known surface water intakes located within 15 miles downstream of the site. There are no drinking water targets downstream of the site since there are no surface water intakes located downstream of the site. The on-site soils at the adit and mine waste piles are contaminated with radionuclides and heavy metals. The site is easily accessible to the public. These areas are livestock grazing areas.

There are several Federally designated or proposed endangered or threatened species within 4 miles of the site. The species are the following: Endangered Black Footed Ferret (Mustels nigripes), Burrowing Owl (Athene cunicularia), Owl (Strix occidentialis), Goshawk, Sharpshinned Hawk; and Rhizome Fleabane (Erigeron rhizomatus).

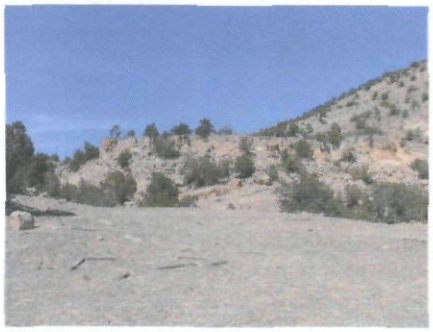
There are no on-site residences, day-care centers, or sensitive environments within 200 feet or 1/2 mile of the site. The prevailing winds is from the west, and the winds of the highest velocity are generally from the west-southwest. The potential for airborne migration of particles and radon gas is high to seasonal high winds. The Haystack community is located 4 miles south of the site, and the nearest resident lives about 3/4

miles from the site. Approximately 500 persons live within radius of the site. Most of the residences are not directly downwind of the site.

REFERENCE 14

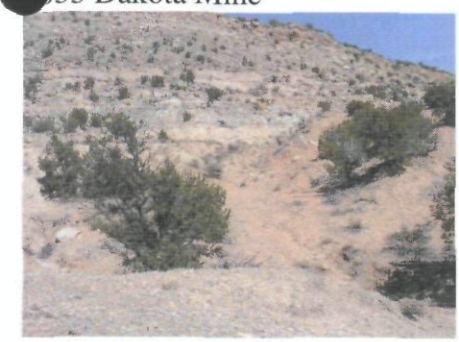
Photographs taken on the March 22, 2005 visit to the Dakota, Febco, and Silver Spur Mines, McKinley County, New Mexico.

Dakota Mine:

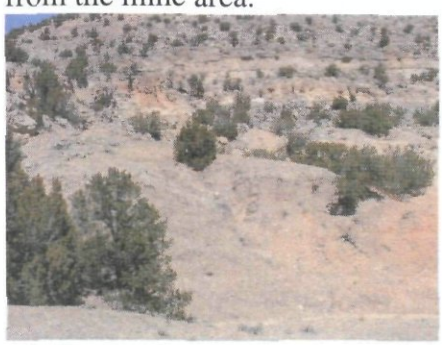


0054 Wooden debris strewn on old mine road.

055 Dakota Mine

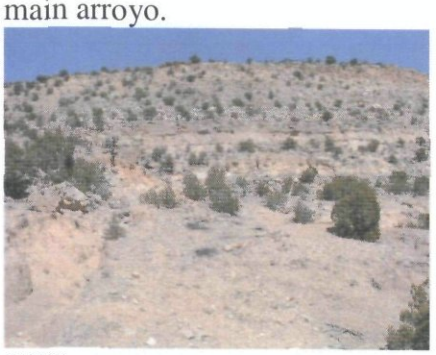


0056 Numerous drainages feeding the main arroyo from the mine area.



057

0058 Erosion channel leading from mine road to main arroyo.



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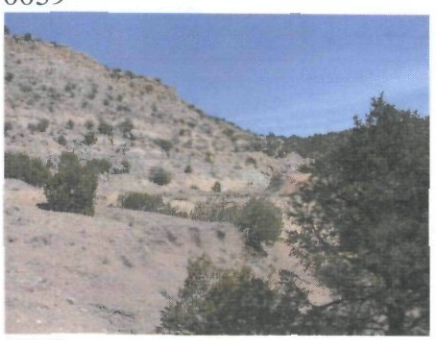
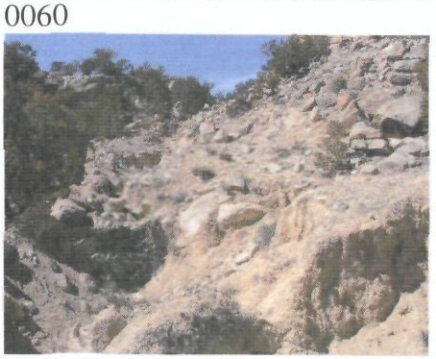


0060

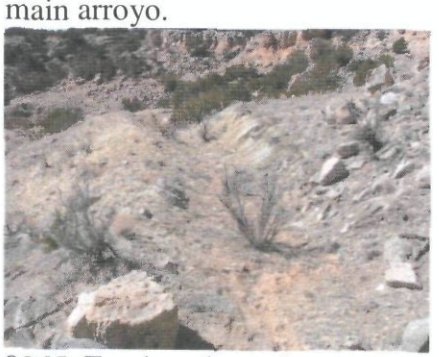


0061 Severe erosion washing out old mine road.

0062

0063

0064 Metal mine debris in erosion drainage leading to main arroyo.

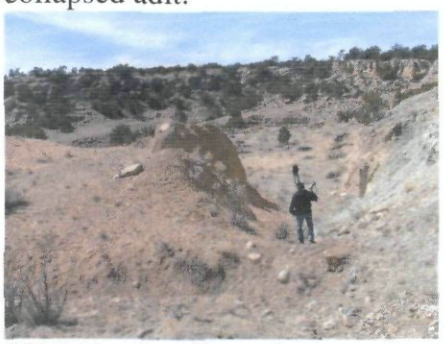


0065 Erosion channel through old road-cut.

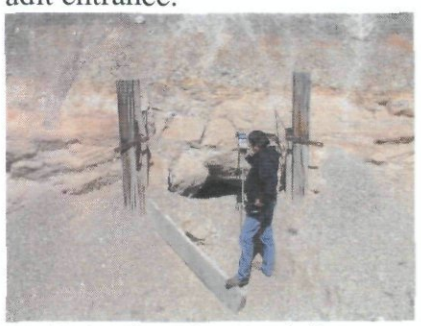
Photographs taken on the March 22, 2005 visit to the Dakota, Febco, and Silver Spur Mines, McKinley County, New Mexico.

0066

0067 Main adit support beams protruding from collapsed adit.



0068 Erosion channels through road-cut by main adit entrance.



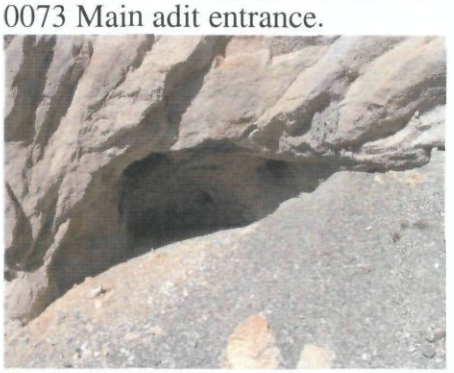
0069 Main adit. Partially collapsed entrance.

0070 Main adit entrance.

0071 Main adit entrance.

0072 Main adit entrance.

0073 Main adit entrance.



0074 Secondary portals near main adit.

0075

0076 Main adit area.

0077 Miscellaneous debris and gamma ray survey meter.

0078 Miscellaneous debris.

Photographs taken on the March 22, 2005 visit to the Dakota, Febco, and Silver Spur Mines, McKinley County, New Mexico.

0079 Miscellaneous debris.

0080 Miscellaneous debris.

0081 Miscellaneous debris.

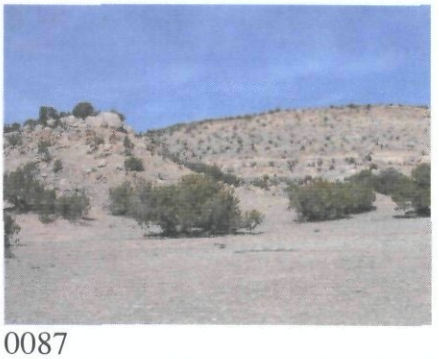
0082 Miscellaneous debris.

0083 Miscellaneous debris.

0084

0085 Miscellaneous debris.

0086 Miscellaneous debris.



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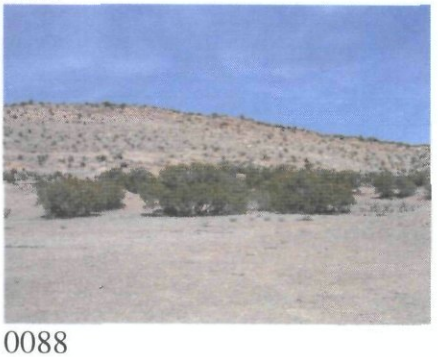

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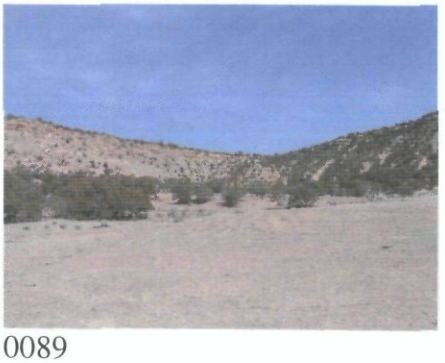
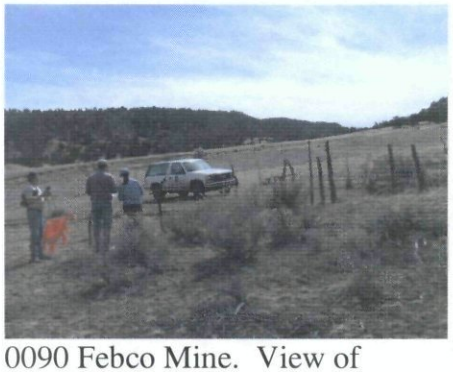


0089

Photographs taken on the March 22, 2005 visit to the Dakota, Febco, and Silver Spur Mines, McKinley County, New Mexico.

Febco Mine:



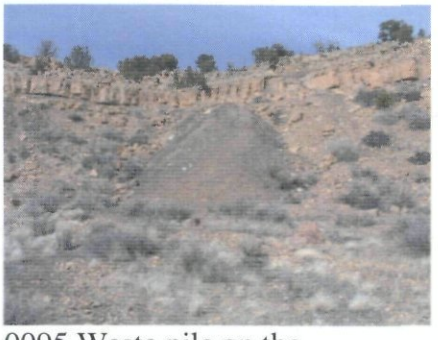
0090 Febco Mine. View of Fence between Indian allottment land and private land.

0091 Looking towards main adits with waste pile below the elevated-contour road.

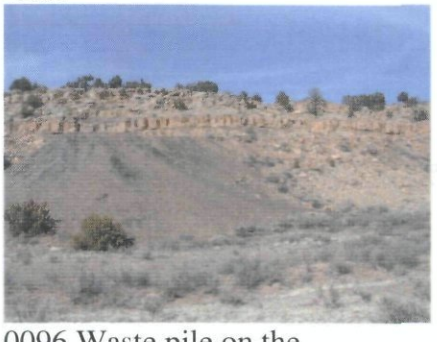
0092

0093

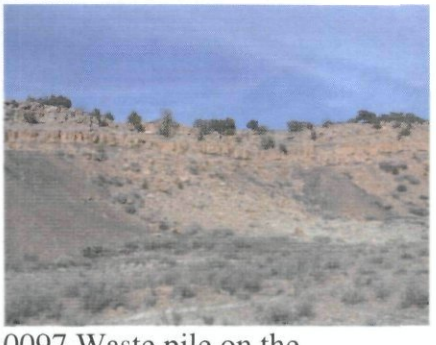
0094 Waste pile below adits and road.



0095 Waste pile on the slope below the adits and road.



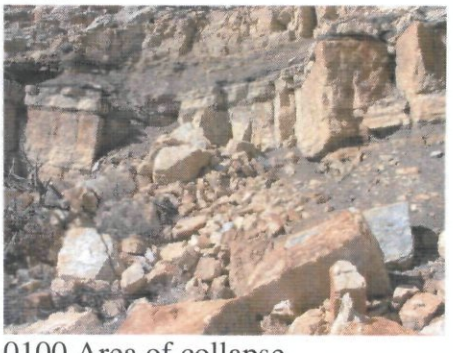
0096 Waste pile on the slope below the adits and road..



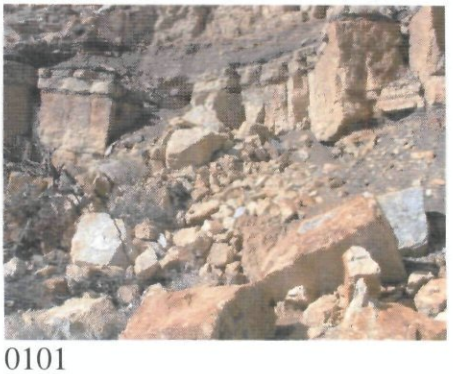
0097 Waste pile on the slope below the adits and road.

0098 Adit road follows contour just below top of mesa with numerous adits.

0099 Waste pile on the slope below the adits and road.



0100 Area of collapse around adits.



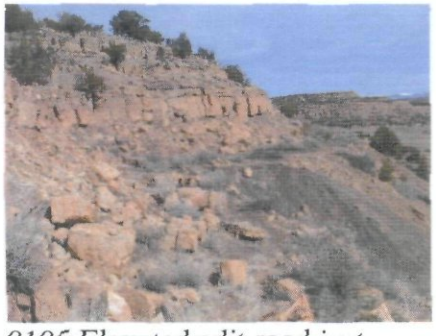
0101

Photographs taken on the March 22, 2005 visit to the Dakota, Febco, and Silver Spur Mines, McKinley County, New Mexico.

0102 Partially collapsed adit entrance.

0103 Partially collapsed adit entrance.

0104 Partially collapsed adit entrance.



0105 Elevated adit road just below top of mesa.

0106

0107 Erosion channel

0108 Soil discoloration along adit road

0109

0110 Partially collapsed adit entrances.

0111Partially collapsed adit entrances.

Photographs taken on the March 22, 2005 visit to the Dakota, Febco, and Silver Spur Mines, McKinley County, New Mexico.

Silver Spur Mine:

0112 Hole on the top of the mesa.

0113 Hole on the top of the mesa.

0114 Hole on the top of the mesa.

0115

0116 Uranium ore.

0117 Blast hole

0118 Cultural site.

0119 Cultural site.

0120 Cultural site.

0121 Cliffs in area near adit, top of mesa

0122 Adit in top of mesa

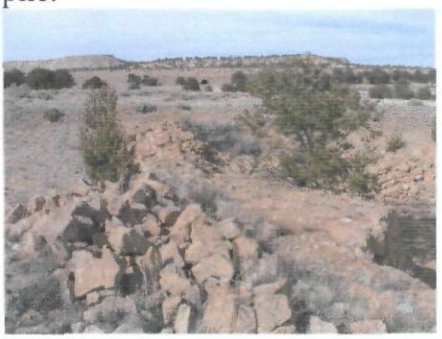
0123 Debris/mine-waste pile.

Photographs taken on the March 22, 2005 visit to the Dakota, Febco, and Silver Spur Mines, McKinley County, New Mexico.

0124 Debris/mine-waste pile.

0125 Debris/mine-waste pile.

0126 Debris/mine-waste pile.



0127 Debris/mine-waste pile.

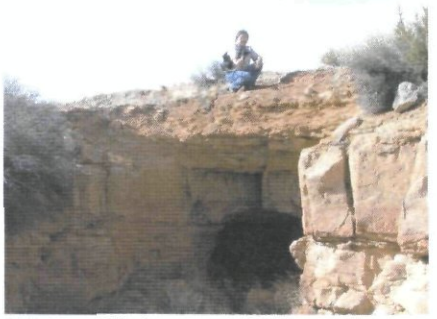
0128 Trench leading to mine adit.

0129 Trench leading to mine adit.

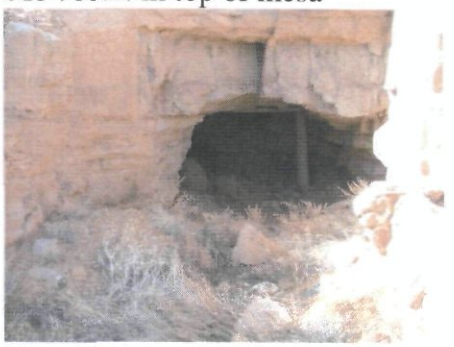
0130 Trench leading to mine adit.

0131 Trench leading to mine adit.

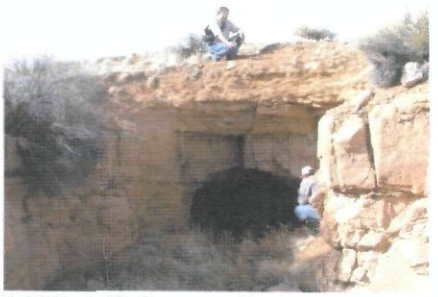
0132 Trench leading to mine shaft.



0134 Adit in top of mesa

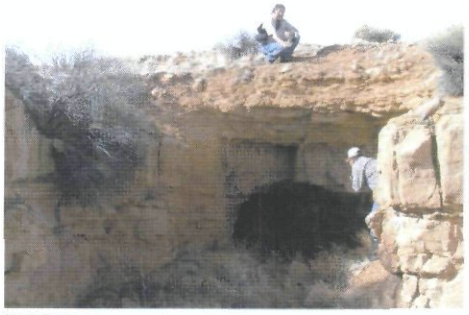


0135 Adit in top of mesa

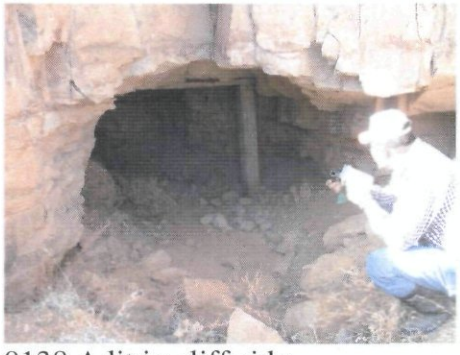


0136 Adit in top of mesa

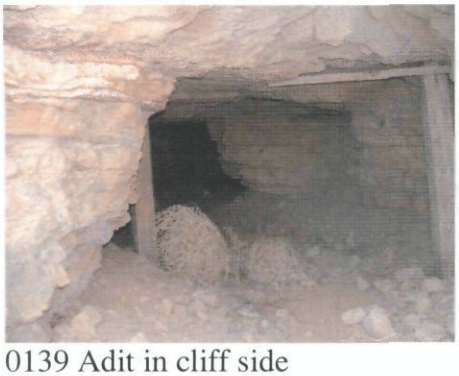
Photographs taken on the March 22, 2005 visit to the Dakota, Febco, and Silver Spur Mines, McKinley County, New Mexico.



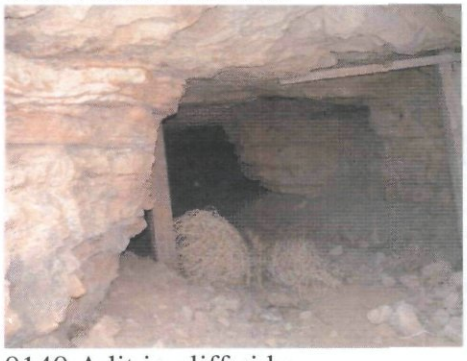
0137



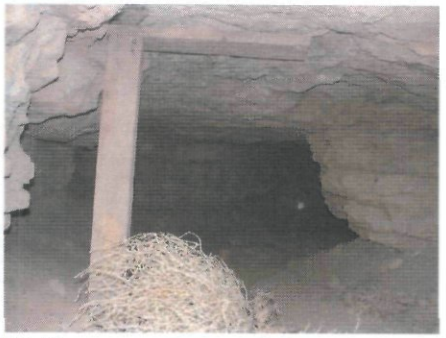
0138 Adit in cliff side



0139 Adit in cliff side



0140 Adit in cliff side



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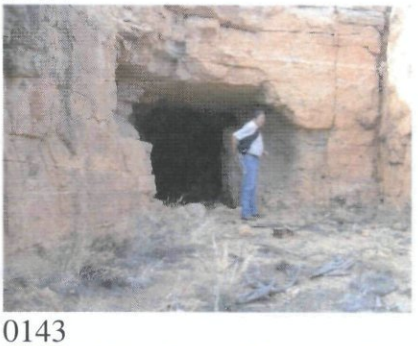
0142



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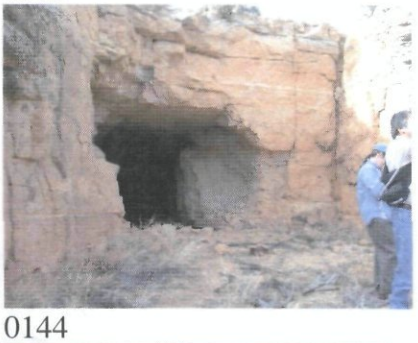

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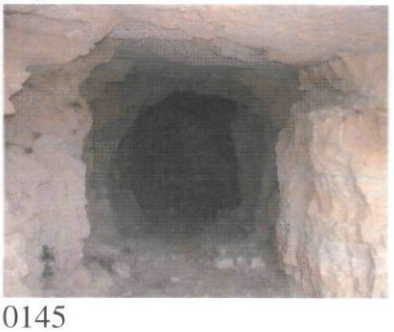
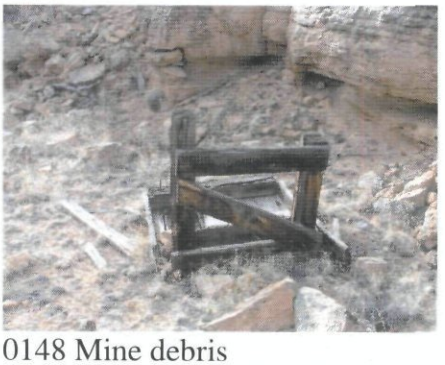


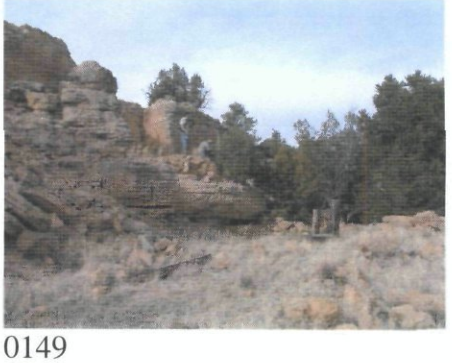
0145

0146 Metal rods protruding from the mine debris.

0147



0148 Mine debris



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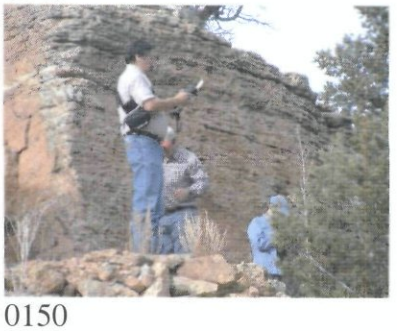
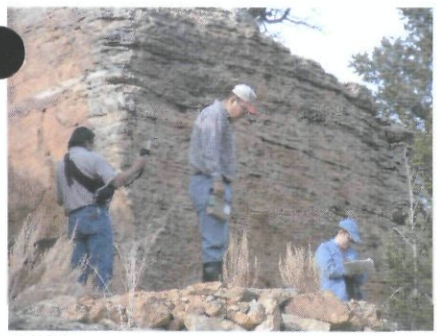


0150

Photographs taken on the March 22, 2005 visit to the Dakota, Febco, and Silver Spur Mines, McKinley County, New Mexico.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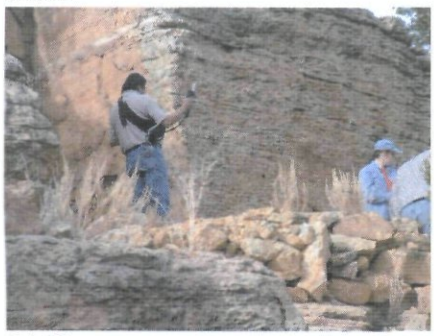
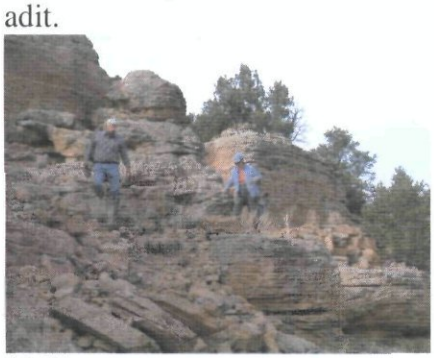

0152


0153 Drainage leading from adit.


0154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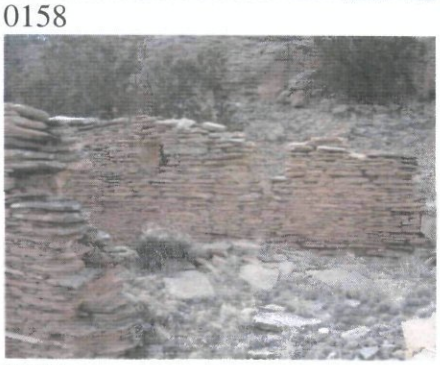
0156


0157


0158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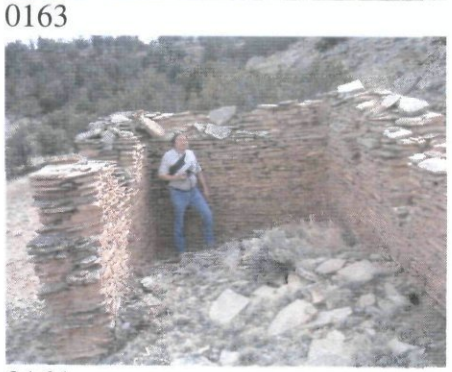
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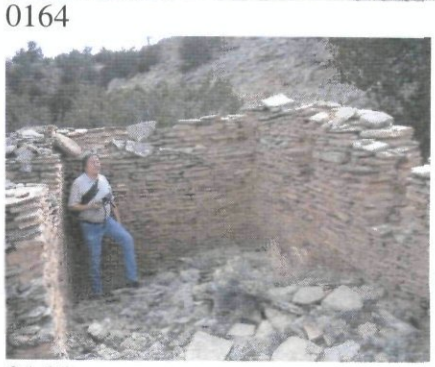

0165

Photographs taken on the March 22, 2005 visit to the Dakota, Febco, and Silver Spur Mines, McKinley County, New Mexico.

0166

0168

0167

0169

Photographs taken by Jake Ingram, NMED. Robin Brown, NMED, Stanley Edison, Navajo Nation Superfund, and Jerry Begay, Navajo Nation Superfund were also present at the visit.

Signature of photographer Date

Print name

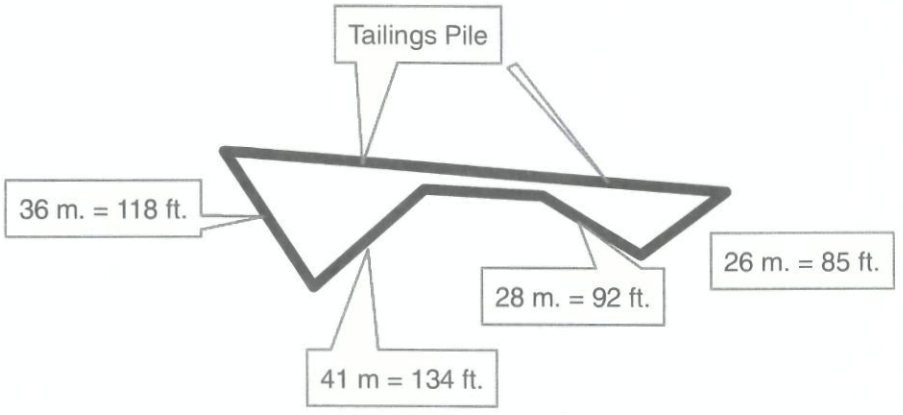
REFERENCE 15

Ref. 15

Febco Mine Source Area Calculations

m	cm	in	feet	feet rounded	
218	21800	8582.6772	715.223097	715	
120	12000	4724.4094	393.700787	394	
		area 1/2 base X Height:		140855	
36	3600	1417.3228	118.110236	118	
41	4100	1614.1732	134.514436	134	
		area 1/2 base X Height:		7906	
28	2800	1102.3622	91.8635171	92	
26	2600	1023.622	85.3018373	85	
		area 1/2 base X Height:		3910	
			sum Tailings pile area:		11816
			Contaminated soil area:		129039

Febco Mine Tailings Pile Area. Calculated using GIS software by Robin Brown, NMED, on 926/05.



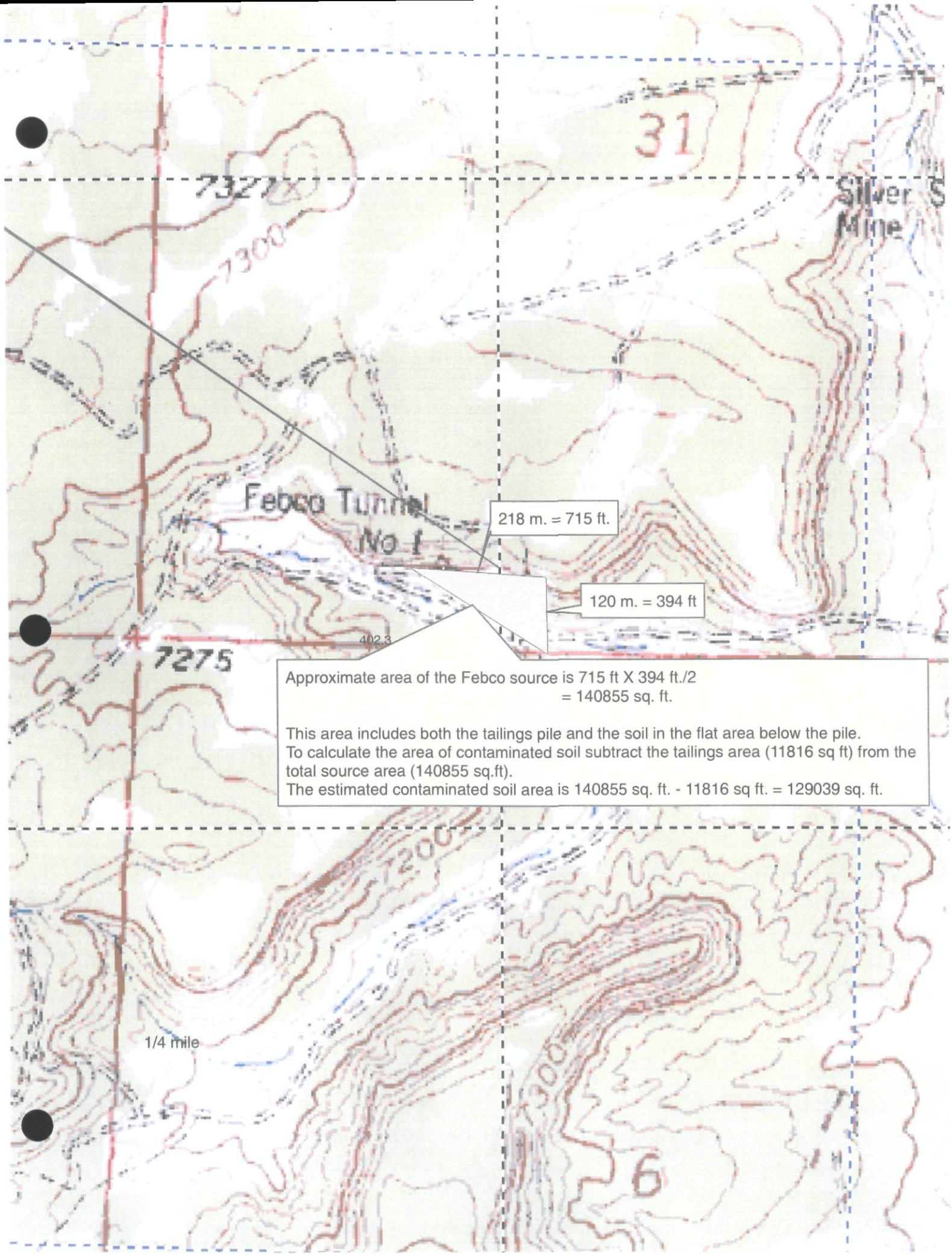
The tailings pile area is 118 ft X 134 ft/2 + 92 ft X 85 ft/2
= 7906 ft+3910 ft
= 11816 sq ft

0 200 400 Feet

N

Legend

Febco Mine GPS Points from 3/22/05, field book page 4 and 14


31
7321
7300
Silver S
Mine
Febco Tunnel
No 1
218 m. = 715 ft.
120 m. = 394 ft
402.3
7275
Approximate area of the Febco source is 715 ft X 394 ft./2
= 140855 sq. ft.
This area includes both the tailings pile and the soil in the flat area below the pile.
To calculate the area of contaminated soil subtract the tailings area (11816 sq ft) from the total source area (140855 sq.ft).
The estimated contaminated soil area is 140855 sq. ft. - 11816 sq ft. = 129039 sq. ft.
7200
1/4 mile
6

REFERENCE 16

00'
35°30'

Grants
NEW MEXICO

1:100 000 — Scale Map of

National Wetlands Inventory

- Wetland classifications
- Highways, roads and other manmade structures
- Water features
- Geographic names

FISH & WILDLIFE SERVICE

1984

Produced by the United States Fish and Wildlife Service

Wetland classifications from 1:58,000 scale color infrared aerial photographs taken 1981 and other source data.

Projection and 10,000 meter, zone 12
Universal Transverse Mercator
25,000-foot grid ticks based on New Mexico coordinate system, central and east zones 1927 North American datum
To place on the predicted North American Datum 1983 move the projection line 1 meter south and 54 meters east

SPECIAL NOTE

This document was prepared primarily by stereoscopic analysis of high altitude aerial photographs. Wetlands were identified on the photographs based on vegetation, visible hydrology, and geography in accordance with **Classification of Wetlands and Deep Water Habitats of the United States** (An Operational Draft) Cowardin, et al, 1977. The aerial photographs typically reflect conditions during the specific year and season when they were taken. In addition, there is a margin of error inherent in the use of the aerial photographs. Thus, a detailed on the ground and historical analysis of a single site may result in a revision of the wetland boundaries established through photographic interpretation. In addition, some small wetlands and those obscured by dense forest cover may not be included on this document.

Federal, State and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, State or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, State or local agencies concerning specific agency regulatory programs and proprietary jurisdictions that may affect such activities.

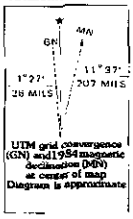
CONVERSION TABLE

Meters	Feet
1	3.2808
2	6.5617
3	9.8425
4	13.1234
5	16.4042
6	19.6850
7	22.9659
8	26.2467
9	29.5276
10	32.8084

To convert meters to feet multiply by 3.2808

To convert feet to meters multiply by 0.3048

DECLINATION DIAGRAM

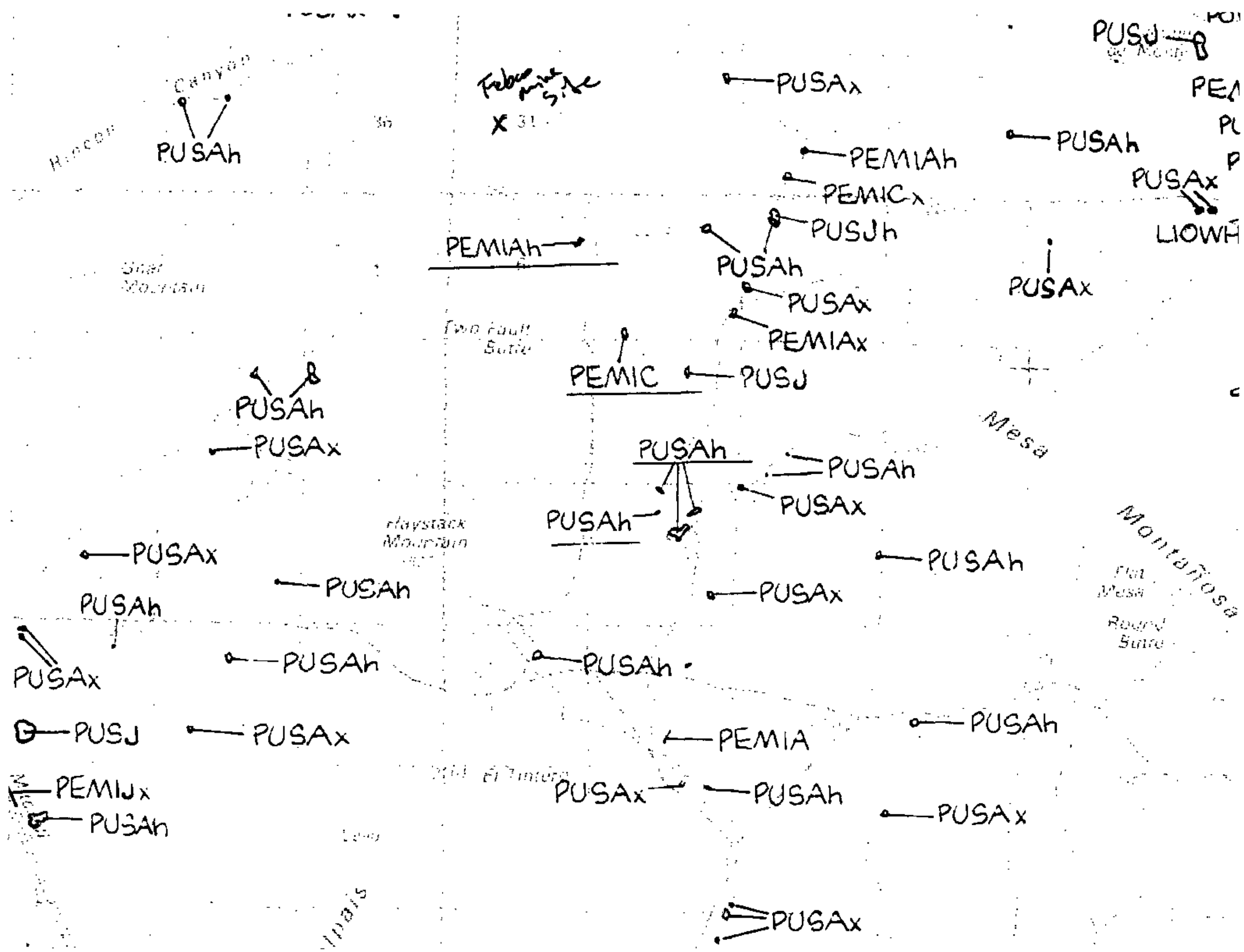


UTM grid convergence (GN) and 1984 magnetic declination (MN) at center of map
Diagram is approximate

ADJOINING MAPS

1	2	3
4		5
6	7	8

1. Gallup
2. Chaco Mesa
3. Los Alamos
4. Zuni
5. Albuquerque
6. Fence Lake
7. Acoma Pueblo
8. Belen



Canyon
Rincon
PUSAh
Febco mine site
X 31
PUSAx
PEMIAh
PEMICx
PUSJh
PUSAh
PUSAx
PEMIAx
PEMIC
PUSJ
PUSJ
PUSAh
PUSAx
LIOWH
PEMIAh
Star Mountain
Two Fault Butte
PUSAx
PUSAh
PUSAx
Mesa
PUSAh
PUSAh
PUSAx
PUSAh
Haystack Mountain
PUSAx
PUSAh
PUSAh
Montañosa
Flat Mesa
Round Butte
PUSAx
PUSAx
PUSAh
PUSAh
PUSJ
PUSAx
PEMIA
PUSAh
PEMIJx
PUSAx
PUSAh
PUSAx
PUSAh
PUSAx

5 Dead
6 *Deciduous*
7 *Evergreen*

5 Dead
6 *Deciduous*
7 *Evergreen*

SYSTEM	P — PALUSTRINE								SYSTEM
CLASS	RB — ROCK BOTTOM	UB — UNCONSOLIDATED BOTTOM	AB — AQUATIC BED	US — UNCONSOLIDATED SHORE	ML — MOSS-LICHEN	EM — EMERGENT	SS — SCRUB-SHRUB	FO — FORESTED	OW — *OPEN WATER/ Unknown Bottom*	CLASS
Subclass	1 Bedrock 2 Rubble	1 Cobble-Gravel 2 Sand 3 Mud 4 Organic	1 Algal 2 Aquatic Moss 3 Rooted Vascular 4 Floating Vascular 5 *Unknown Submerge* 6 *Unknown Surface*	1 Cobble-Gravel 2 Sand 3 Mud 4 Organic 5 Vegetated	1 Moss 2 Lichen	1 Persistent 2 Nonpersistent	1 Broad-Leaved Deciduous 2 Needle-Leaved Deciduous 3 Broad-Leaved Evergreen 4 Needle-Leaved Evergreen 5 Dead 6 *Deciduous* 7 *Evergreen*	1 Broad-Leaved Deciduous 2 Needle-Leaved Deciduous 3 Broad-Leaved Evergreen 4 Needle-Leaved Evergreen 5 Dead 6 *Deciduous* 7 *Evergreen*		Subclass

6 Unknown Surface

MODIFIERS

In order to more adequately describe wetland and deepwater habitats one or more of the water regime, water chemistry, soil, or special modifiers may be applied at the class or lower level in the hierarchy. The farmed modifier may also be applied to the ecological system.

WATER REGIME

Non-Tidal

- A Temporarily Flooded
- B Saturated
- C Seasonally Flooded
- D *Seasonally Flooded/ Well Drained*
- E *Seasonally Flooded/ Saturated*
- F Semipermanently Flooded
- G Intermittently Exposed
- H Permanently Flooded
- J Intermittently Flooded
- K Artificially Flooded
- W Intermittently Flooded/Temporary
- Y Saturated/Semipermanent/ Seasonal
- Z Intermittently Exposed/Permanent
- U *Unknown*

Tidal

- K *Artificially Flooded*
- L Subtidal
- M Irregularly Exposed
- N Regularly Flooded
- P Irregularly Flooded
- *S Temporary Tidal
- *R Seasonal-Tidal
- *T Semipermanent-Tidal
- *V Permanent-Tidal
- U *Unknown*

*These water regimes are only used in tidally influenced, freshwater systems

WATER CHEMISTRY

Coastal Halinity

- 1 Hyperhaline
- 2 Euhaline
- 3 Mixohaline *(Brackish)*
- 4 Polyhaline
- 5 Mesohaline
- 6 Oligohaline
- 0 Fresh

Inland Salinity

- 7 Hypersaline
- 8 Eusaline
- 9 Mixosaline
- 0 Fresh

pH Modifiers for all Fresh Water

- a Acid
- i Circumneutral
- e Alkaline

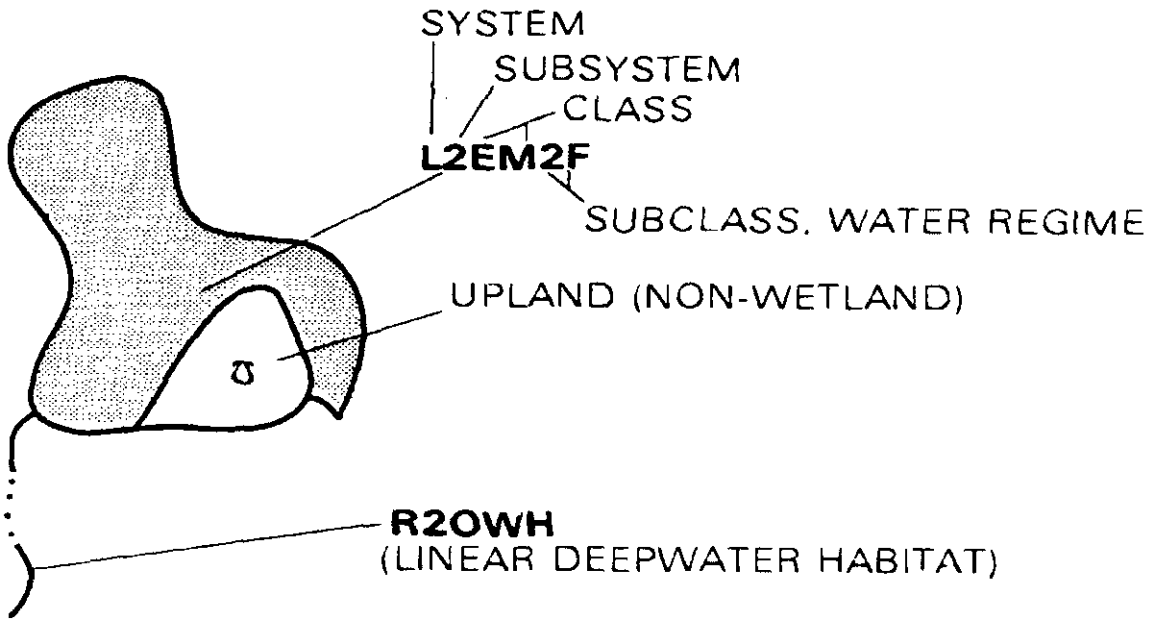
SOIL

- g Organic
- n Mineral

SPECIAL MODIFIERS

- b *Beaver*
- d *Partially Drained/Ditched*
- f Farmed
- h *Diked/Impounded*
- r Artificial Substrate
- s *Spoil*
- x Excavated

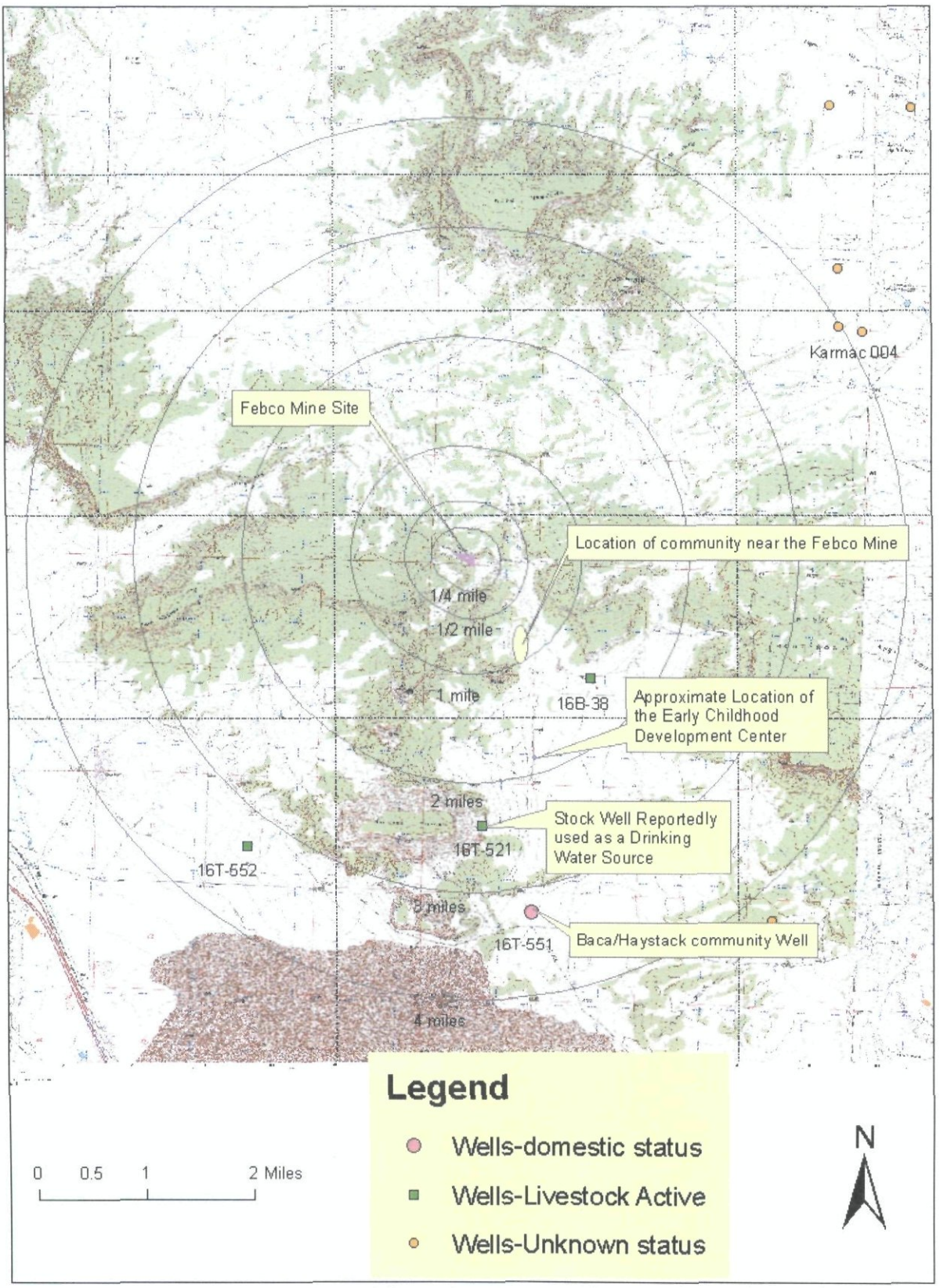
SYMBOLOGY EXAMPLE



Ʊ — Primarily represents **upland** areas, but may include unclassified wetlands such as man-modified areas, non photo-identifiable areas and/or unintentional omissions.

REFERENCE 17

Ref 17



Ref. 18 p. 3, 5 and 7; Ref. 4 p. 12; Ref. 7 p. 3; Ref. 20; Ref. 27.

Figure 3. Four Mile Radius Map.

REFERENCE 18

Follow up
Attachments can contain viruses that may harm your computer. Attachments may not display correctly.

Brown, Robin, NMENV

From: Navajo Nation EPA - PWSSP [nnepa_pwssp@yahoo.com] **Sent:** Mon 8/15/2005 1:03 PM
To: Brown, Robin, NMENV; ybarney@navajopublicwater.org
Cc:
Subject: Information for Wells around Black Jack Mine #1 and Silver Spur Mine.
Attachments: Wells-All-BJM1.xls(20KB) Wells-All-SSM.xls(17KB) PWS-BJM1.xls(12KB) PWS-SSM.xls(10KB) Wells-NM3500211-BJM1.xls(15KB) Wells-NM3503060-BJM1.xls(10KB) Wells-NM3500254-SSM.xls(10KB) z1-Inorganics.xls(25KB) z2-NitrateNitrite.xls(19KB) z3-VOCs.xls(20KB) z4-SOCs.xls(46KB) z5-Rads.xls(29KB)

Good afternoon Ms. Brown,

Sorry for not getting this information to you any sooner. I am Delfred Gene and I work under Yolanda Barney of the Navajo Nation Public Water Systems Supervision Program (PWSSP) within the Navajo Nation Environmental Protection Agency.

Attached are Microsoft Excel files containing information about wells around the Black Jack Mine #1 (BJM1) and Silver Spur Mine (SSM).

Files "Wells-All-BJM1.xls" and "Wells-All-SSM.xls" contain well numbers, names, and locations for different kinds of wells around the mine sites. Our program obtained the data several years ago from the Navajo Nation Department of Resources (NNDWR) [phone: 928-729-4003] in Fort Defiance, AZ. The PWSSP have water quality data only for official public water systems. The NNDWR might have water quality data for the other types of wells (private, livestock, industrial, monitoring, etc).

Files "PWS-BJM1.xls" and "PWS-SSM.xls" contain information for the official public water systems that have wells within the study radius. Three public water systems are affected: the Navajo Tribal Utility Authority's (NTUA) Smith Lake regional community water system (PWSID# NM3500211) and the NTUA Casamero Cup community water system (PWSID# NM3503060) are located near the Black Jack Mine #1, and the NNDWR Baca/Haystack community water system (PWSID# NM3500254) near the Silver Spur Mine.

Files "Wells-NM3500211-BJM1.xls", "Wells-NM3503060-BJM1.xls", and "Wells-NM3500254-SSM.xls" contain more well information for those drinking water wells that serve the NTUA Smith Lake, NTUA Casamero Cup, and NNDWR Baca/Haystack public water systems, respectively.

Files that begin with "z" contain water quality data for those drinking water wells mentioned in the previous paragraph.

If there are any questions, please contact my supervisor Yolanda Barney at 928-871-7715 or at ybarney@navajopublicwater.org.

Sincerely,
Delfred Gene
Navajo Nation Public Water Systems Supervision Program
Navajo Nation Environmental Protection Agency

Do You Yahoo!?

Wells within 4-mile radius of Black Jack Mine #1.

File from Navajo EPA: Wells-All-BJM1										
OPERATOR	WELL NO	UTM EAST	UTM NORTH	WATERSHED	COMPLETED	ELEVATION	DEPTH	AQUIFER	SWL	DATE
NTUA	16T-539	7 62 478	39 38 810	13020207	12/8/1965	7363.0	1470.0	221MRSN	650.0	12/8/1965
NTUA	16T-593	7 59 475	39 36 160	13020207	5/4/1974	7269.0	1620.0	221ENRD	462.0	4/5/1974
NTUA	16T-594	7 60 940	39 36 260	13020207	2/27/1978	7215.0	2024.0	211DKOT	407.0	2/27/1978
NTUA	16T-597	7 60 900	39 35 500	13020207	11/16/1978	7228.0	1939.0	211DKOT	474.6	11/16/1978
LANCE CORP	LANCE #1	7 56 806	39 37 100	13020207	00000000	7434.0	1000.0	221CSPG	800.0	7/11/1961
LANCE CORP	LANCE #2	7 56 806	39 37 100	13020207	00000000	7434.0	1012.0	221CSPG	800.0	7/11/1961
MISSION	SMIT LAKE 01	7 59 227	39 34 456	13020207	00000000	7250.0	679.0	211DKOT	355.0	6/8/1955
NUCLEAR	16-UNK-0006	7 56 889	39 32 476	13020207000	9/29/1979	7485.0	3102.0	313SADG	550.0	1/1/1979
RATION	16T-571	7 59 805	39 34 060	13020207	00000000	0.0	0.0		0.0	00000000
TIDEWATER	MARIANO -1	7 50 499	39 37 291	0	00000000	7490.0	4686.0		0.0	00000000
TIDEWATER	TIDEWATER001	7 50 624	39 35 537	0	00000000	7420.0	494.0	211DKOT	0.0	00000000
TRDG POST	SMIT LAKE 02	7 59 130	39 34 330	13020207	00000000	7280.0	1100.0	221DKOT	9.0	6/8/1955
TRDG POST	SMIT LAKE 03	7 59 576	39 34 620	13020207	00000000	7260.0	1100.0	221WSRC	600.0	11/30/1972
TRIBE O&M	16-2-15	7 62 680	39 37 760	0	00000000	0.0	0.0		0.0	00000000
TRIBE O&M	16-3-13	7 61 624	39 37 319	13020207	00630719	0.0	0.0		0.0	00000000
TRIBE O&M	16-31	7 53 700	39 32 750	13020207	00000000	7620.0	10.0		0.0	00000000
TRIBE O&M	16-41	7 54 820	39 34 540	0	00000000	7445.0	0.0		0.0	00000000
TRIBE O&M	16-6-6	7 59 520	39 34 690	13020207	1/1/1965	7230.0	0.0		0.0	00000000
TRIBE O&M	16-9	7 59 470	39 34 700	0	00000000	7230.0	0.0		0.0	00000000
TRIBE O&M	16K-525	7 59 890	39 35 956	13020207	00000000	7240.0	1221.0	221WSRC	0.0	00000000
TRIBE O&M	16T-325	7 59 733	39 36 167	13020207	1/23/1959	7240.0	1800.0	221WSRC	610.0	1/23/1959
TRIBE O&M	16T-325B	7 59 733	39 36 167	13020207	1/23/1959	7240.0	1800.0	221CSPG	630.0	1/23/1959
TRIBE O&M	16T-519	7 52 897	39 34 490	0	12/3/1963	7510.0	1275.0	221CSPG	502.0	12/3/1963
TRIBE O&M	16T-610	7 50 925	39 39 130	0	9/17/1981	7500.0	1400.0		972.0	9/17/1981
UNKNOWN	16-649	7 51 560	39 34 310	0	00000000	0.0	0.0		0.0	00000000
UNKNOWN	16-UNK-0005	7 59 378	39 36 218	14080106000	4/5/1974	7268.0	3170.0	221ENRD	670.0	4/5/1974
UNKNOWN	16K-303C	7 50 460	39 36 800	0	00000000	7550.0	500.0		0.0	00000000
UNKNOWN	16K-318	7 50 556	39 37 940	0	19481000	7410.0	292.0	211DKOT	230.0	10/3/1948
UNKNOWN	16K-325	7 59 791	39 35 891	13020207	00000000	7240.0	696.0	211DKOT	398.5	9/8/1955
UNKNOWN	16K-327	7 59 791	39 35 891	13020207	6/3/1952	0.0	701.0	211DKOT	398.5	6/3/1952
UNKNOWN	16T-591	7 54 899	39 35 041	13020207	3/21/1977	7480.0	1400.0	221CSPG	562.0	3/24/1977
UNKNOWN	LEO HOUSE	7 54 820	39 34 540	13020207	7/8/1968	0.0	1355.0		712.0	7/8/1968
WESTERN NU	16-UNK-0002	7 51 833	39 33 782	15020006000	00000000	7610.0	1308.0	221ENRD	676.1	1/28/1982
	16PH-590	7 59 510	39 36 100	13020207	00000000	0.0	0.0		0.0	00000000

Received 8/15/05

Wells within 6-mile radius of the Silver Spur Mine.

File from Navajo EPA: Wells-All-SSM.xls										
OPERATOR	WELLNO	UTM EAST	UTM NORTH	WATERSHED	COMPLETED	ELEVATION	DEPTH	AQUIFER	SWL	DATE
TRIBE O&M	16T-551	7 79 214	39 15 535	13020207000	9/17/1969	6905.0	1083.0	231SNSL	446.0	9/17/1969
ELKIN	BACA-11	7 69 370	39 19 209	13020207	00000000	6790.0	100.0		45.3	6/23/1948
KARMAC	KARMAC 002	7 82 975	39 27 649	13020207	00000000	7135.0	735.0	211BRSSB	0.0	00000000
KARMAC	KARMAC 003	7 83 226	39 25 281	13020207	00000000	7077.0	1003.0	221WSRC	525.0	3/27/1957
KARMAC	KARMAC 004	7 83 279	39 24 419	13020207	00000000	7016.0	3086.0	313SADR	573.7	3/22/1957
KARMAC	KARMAC 005	7 83 634	39 24 368	13020207	00000000	7023.0	745.0	221WSRC	449.2	9/27/1956
PRIVATE	B-1326	7 69 620	39 23 650	13020207000	3/11/1996	6865.0	185.0		0.0	00000000
REFINERY	BACA-2	7 69 997	39 16 822	13020207	00000000	6800.0	774.0		144.0	6/23/1948
RIO DEL OR	R. D. O. 001	7 84 185	39 27 687	13020207	00000000	7100.0	350.0	221WSRC	0.0	00000000
SABER PINO	SABRE PINON	7 86 011	39 23 487	13020207	00000000	6970.0	0.0	221WSRC	424.0	11/6/1956
TRIBE O&M	16-2-6	7 85 001	39 16 070	0	00000000	7080.0	0.0		0.0	00000000
TRIBE O&M	16B-38	7 79 911	39 19 037	13020207	5/12/1936	7000.0	357.0	221SMVR	305.0	5/12/1936
TRIBE O&M	16T-521	7 78 414	39 16 770	13020207	11/13/1963	7162.0	414.0	221ENRD	365.0	11/13/1963
TRIBE O&M	16T-552	7 74 943	39 16 262	13020207	10/9/1969	6855.0	1268.0	231CHNL	362.0	10/9/1969
TRIBE O&M	16T-586	7 78 600	39 17 300	13020207	6/18/1976	7080.0	2400.0		47.0	6/16/1976
UNKNOWN	16T-522	7 82 794	39 15 615	13020207	00000000	6950.0	270.0		0.0	00000000
UNKNOWN	BACA-10	7 70 676	39 18 631	13020207	00000000	6770.0	100.0		36.2	6/24/1948
ZUNI T. P.	BACA-1	7 70 570	39 16 253	13020207	00000000	6805.0	180.0		84.8	9/18/1962

File from Navajo EPA: PWS-BJM1.xls

PWSID#	PWS Name	PWS Active	Jurisdiction	PWS Type	Consecutive
3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	Yes	NNEPA	Community	No
3503060	CASAMERO CUP -NTUA	Yes	NNEPA	Community	No

Owner	Owner Category	Address	City	State	Zip Code
NAVAJO TRIBAL UTILITY AUTHORITY	NTUA	PO Box 170	Fort Defiance	AZ	86504-0170
NAVAJO TRIBAL UTILITY AUTHORITY	NTUA	PO Box 170	Fort Defiance	AZ	86504-0170

Contact Person	PWS Web Page	PWS E-Mail	Contact Phone #	Contact Fax #	Laboratory
Prestene Garnenez, Supervisor	www.ntua.com	richardl@ntua.com	(928) 729-5721	(928) 729-2135	NTUA
Prestene Garnenez, Supervisor	www.ntua.com	richardl@ntua.com	(928) 729-5721	(928) 729-2135	NTUA

Interconnected	Systems Interconnected	Community	County
Yes	NM3500265 NTUA Casamero Lake, NM3500260 NTUA Chuch Rock	Smith Lake, Mariano Lake, Pinedale, Churchrock	McKinley, NM
No		Smith Lake, Northeast of	McKinley, NM

State	Agency	Population	Connections	Source Type	Schedule	IHS Service Unit	Last Survey Date	Survey Date
NM	Eastern	4,133	1,117	Ground water	Yes	Crownpoint	10/15/2001	7/15/2004
NM	Eastern	30	8	Ground water	Yes	Crownpoint	4/9/2002	5/17/2005

Surveyors	PVC	Transcite	Lead Pipes	Galvanized Pipes	Booster Stations	Water Points	Tanks
CHISCHILLY, MORGAN -NNEPA/BESOLA -OEHE	Yes	No			0	No	6
NEZ, SILVER -NNEPA/BESOLA, HOWELL -OEHE	Yes	No			0	No	1

Capacity, gal	EWSP	Operator 1, Last	Operator 1, First	Operator 1, Title	Operator 2, Last	Operator 2, First	Operator 2, Title
735,000	No	Johnson	Bill	Master System Operator			
17,000	Yes	Shorty	Shawn	System Operator Apprentice			

Facility Person	Facility	Facility Phone	Address	City	State	Zip Code
Jerry Sillago	NTUA Crownpoint District	(505) 786-5566	PO Box 1825	Crownpoint	NM	87313-1825
Jerry Silago	NTUA Crownpoint District	(505) 786-5566	PO Box 1825	Crownpoint	NM	87313-1825

Comments	Last Revised	By
Mariano Lakes/Pinedale has 180 connections and it was surveyed on 07/14/04; Surveyors: NEZ, SILVER - NNEPA/BENALLY, HALL, BESOLA -OEHE	12/20/2004	
T[redacted]system failed to collect Inorganic Chemical samples at well 16T-5[redacted] 2002.	5/18/2005	

File from Navajo EPA: PWS-SSM.xls

PWSID#	PWS Name	PWS Active	Jurisdiction	PWS Type	Consecutive
3500254	BACA/HAYSTACK -O&M	Yes	NNEPA	Community	No

Owner	Owner Category	Address	City	State	Zip Code
WATER RESOURCES MANAGEMENT	Tribal government	PO Box 678	Fort Defiance	AZ	86504-0678

Contact Person	PWS Web Page	PWS E-Mail	Contact Phone #	Contact Fax #	Laboratory
Donald Daswood, Programs and Projects Specialist			(928) 729-4033	(928) 729-4029	NTUA

Interconnected	Systems Interconnected
No	

Community	County	State	Agency	Population	Connections	Source Type	Schedule
Haystack Chapter	McKinley, NM	NM	Eastern	500.00	100.00	Ground water	Yes

IHS Service Unit	Last Survey Date	Survey Date	Surveyors	PVC	Transcite
Crownpoint	18-Jul-01	Monday, September 22, 2003	GENE, MORGAN -NNEPA	Yes	No

Lead Pipes	Galvanized Pipes	Booster Stations	Water Points	Tanks	Capacity, gal	EWSP	Operator 1, Last	Operator 1, First
		0.00		1.00	80,000.00	No	Benally, Sr.	Benson

Operator 1, Title	Operator 2, Last	Operator 2, First	Operator 2, Title	Facility Person	Facilty Title
Construction Supervisor	Denetso	Marvin	Electrician II	Benson Benally, Sr.	26

Facility	Facility Phone	Address	City	State	Zip Code	Comments	Last Revised	By
Crownpoint Station #19	(505) 786-5313	PO Box 1936	Crownpoint	NM	87313-1936		Wednesday, July 18, 2001	Michelle

File from Navajo EPA: Wells-NM3500211-BJM1.xls

PWSID#	PWS Name	Owner	Tribal Well #
3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	NAVAJO TRIBAL UTILITY AUTHORITY	16T-593
3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	NAVAJO TRIBAL UTILITY AUTHORITY	16T-594
3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	NAVAJO TRIBAL UTILITY AUTHORITY	16T-595
3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	NAVAJO TRIBAL UTILITY AUTHORITY	16T-596
3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	NAVAJO TRIBAL UTILITY AUTHORITY	16T-597

PWSID#	Source	Status Source	Type	Well elevation	Depth (ft)	SWL	Pump setting	Flow	Casing (in)
3500211	Smith Lake Mut Help Hsg	Off-line	Well	7,264.00	1,640.00	462.00	997.00	41.00	8.60
3500211	Smith Lake #1	Active	Well	7,215.00	1,580.00	502.00	908.00	99.00	8.60
3500211	Mariano Lake East #1	Active	Well	7,122.00	1,640.00	515.00	1,197.00	100.00	8.60
3500211	Mariano Lake West #2	Active	Well	7,160.00	1,610.00	544.00	1,491.00	48.00	8.00
3500211	Smith Lake #2	Active	Well	7,228.00	1,935.00	559.00	909.00	72.00	8.00

PWSID#	Aquifer	Date Drilled	Well control, primary	Well control, secondary	MPA	MPA Date	Disinfection primary
3500211		04/05/1974	Time clock	Pressure switch			None
3500211		11/07/1977	Radio telementry	Time clock			Chlorine gas
3500211		05/25/1978	Radio telementry	Time clock			Chlorine gas
3500211		08/09/1978	Radio telementry	Time clock			Chlorine gas
3500211		08/28/1978	Radio telementry	Time clock			Chlorine gas

PWSID#	Disinfection secondary	Hypochlorite	Cl- percentage	Calcium Hypochlorite	Other Cl- percentage	Other Disinfection	Free	Total
3500211	None	None		None		None		
3500211	None	None		Gas Chlorination		None		
3500211	None	None		Gas Chlorination		None		
3500211		None		Gas Chlorination		None		
3500211		None		Gas Chlorination		None		

PWSID#	Type of Fluoride	Fluoride level	Treatments	Turbidity Removal	Iron/Manganese Removal	Softening	Land Status
3500211	None		None		None	None	Tribal Trust
3500211	Natural Fluoride		Iron Sequestration		None	None	Indian Allotment
3500211	Hydrofluorosilicic Acid		None		None	None	Tribal Trust
3500211	Hydrofluorosilicic Acid		Iron Sequestration		None	None	Indian Allotment
3500211	Hydrofluorosilicic Acid		None		None	None	Tribal Trust

PWSID#	Grazing district	Status Verified	Chapter	USGS Quad Map	Township	North/South	Range	East/West
3500211	16	Yes	Smith Lake, McKINLEY, NM	Hosta Butte	15	N	12	W
3500211	16	Yes	Smith Lake, McKINLEY, NM	Casamero Lake	15	N	12	W
3500211	16	No	Smith Lake, McKINLEY, NM	Mariano Lake	16	N	14	W
3500211	16	Yes	Pinedale, McKINLEY, NM	Mariano Lake	16	N	14	W
3500211	16	No	Smith Lake, McKINLEY, NM	Casamero Lake	15	N	12	W

Fi[illegible]rom Navajo EPA: Wells-NM3500211-BJM1.xls

PWSID#	Section	Quarter/Half	Meridian	UTM Zone	UTM X (east)	UTM Y (north)	UTM Correction	Location Verified
3500211	17 NW		NMPM (NM)	12	7 59 475	39 36 160	No	Water Resources Management
3500211	17 NE		NMPM (NM)	12	7 60 940	39 36 260	No	Water Resources Management
3500211	27 NE		NMPM (NM)	12	7 44 180	39 42 090	No	Water Resources Management
3500211	28 NE		NMPM (NM)	12	7 42 850	39 42 060	No	Water Management
3500211	17 SE		NMPM (NM)	12	7 60 900	39 35 500	No	Water Resources Management

PWSID#	Comments
3500211	There was no vacuum breaker equipped on the 3/4-inch hose bibb sampling tap. The chlorine chemical system was off-line. Weeds and small trees were noted within the compound. The fence compound was in disrepair. There was no adequate floor
3500211	drain screen
3500211	The sanitary seals need to be repaired. The roof was beginning to deteriorate. The glass panel was not clear. REPEATED VIOLATION: The floor drain outlet pipe could not be located. REPEATED VIOLATION: One bolt was missing. REPEATED VIOLATION: Vacuum
3500211	The sanitary seal needs to be repaired. The ventilation fan did not activate automatically when door was opened and was not operational. The heater was not functioning. Rodent burrows were noted around and under the valve box. The roof were beginning
3500211	Flanges located in the chemical room were corroded.

File from Navajo EPA: Wells-NM3503060-BJM1.xls

PWSID#	PWS Name	Owner	Tribal Well #	Source	Status Source
3503060	CASAMERO CUP -NTUA	NAVAJO TRIBAL UTILITY AUTHORITY	16T-539	Casamero Cup	Active

Type	Well elevation	Depth (ft)	SWL	Pump setting	Flow	Casing (in)	Aquifer	Date Drilled
Well	7,363.00	1,470.00	256.00	698.00	12.00	6.00		03/05/1986

Well control, primary	Well control, secondary	MPA	MPA Date	Disinfection primary	Disinfection secondary
None	None			Sodium hypochlorite 5.25%	

Hypochlorite	Cl- percentage	Calcium Hypochlorite	Other Cl- percentage	Other Disinfection	Free	Total	Type of Fluoride
Chlorine Bleach	5.00	None		None			None

Fluoride level	Treatments	Turbidity Removal	Iron/Manganese Removal	Softening	Land Status	Grazing district
	None		None	None	Indian Allotment	16

Status Verified	Chapter	USGS Quad Map	Township	North/South	Range	East/West	Section	Quarter/Half
Yes	Casamero Cup, McKINLEY, NM	Casamero Lake	15	N	12	W	4	NE

Meridian	UTM Zone	UTM X (east)	UTM Y (north)	UTM Correction	Location Verified	Comments
NMPM (NM)	12	7 62 478	39 38 810	No	Water Resources Management	REPEATED VIOLATION: The covers were not provided for the inlet/outlet of the chlorine tank container.

File from Navajo EPA: Wells-NM35000254-BJM1.xls

PWSID#	PWS Name	Owner	Tribal Well #	Source	Status Source	Type
3500254	BACA/HAYSTACK -O&M	WATER RESOURCES MANAGEMENT	16T-551	Haystack	Active	Well

Well elevation	Depth (ft)	SWL	Pump setting	Flow	Casing (in)	Aquifer	Date Drilled	Well control, primary
	1,085.00			42.00	9.00		09/11/1969	Time clock

Well control, secondary	MPA	MPA Date	Disinfection primary	Disinfection secondary	Hypochlorite
Manual			Sodium hypochlorite 10%	None	None

Cl- percentage	Calcium Hypochlorite	Other Cl- percentage	Other Disinfection	Free	Total	Type of Fluoride
	None		None		1.00	None

Fluoride level	Treatments	Turbidity Removal	Iron/Manganese Removal	Softening	Land Status	Grazing district
	None		None	None	Indian Allotment	16

Status Verified	Chapter	USGS Quad Map	Township	North/South	Range	East/West	Section	Quarter/Half
Yes	Haystack, McKINLEY, NM	Bluewater	13 N		10 W		20	NW

Meridian	UTM Zone	UTM X (east)	UTM Y (north)	UTM Correction	Location Verified	Comments
NMPM (NM)	12	7 79 214	39 15 535	No	Water Resources Management	

File from Navajo EPA: Wells-NM3503060-BJM1.xls

PWSID#	PWS Name	Owner	Tribal Well #	Source	Status Source
3503060	CASAMERO CUP -NTUA	NAVAJO TRIBAL UTILITY AUTHORITY	16T-539	Casamero Cup	Active

Type	Well elevation	Depth (ft)	SWL	Pump setting	Flow	Casing (in)	Aquifer	Date Drilled
Well	7,363.00	1,470.00	256.00	698.00	12.00	6.00		03/05/1986

Well control, primary	Well control, secondary	MPA	MPA Date	Disinfection primary	Disinfection secondary
None	None			Sodium hypochlorite 5.25%	

Hypochlorite	Cl- percentage	Calcium Hypochlorite	Other Cl- percentage	Other Disinfection	Free	Total	Type of Fluoride
Chlorine Bleach	5.00	None		None			None

Fluoride level	Treatments	Turbidity Removal	Iron/Manganese Removal	Softening	Land Status	Grazing district
	None		None	None	Indian Allotment	16

Status Verified	Chapter	USGS Quad Map	Township	North/South	Range	East/West	Section	Quarter/Half
Yes	Casamero Cup, McKINLEY, NM	Casamero Lake	15	N	12	W	4	NE

Meridian	UTM Zone	UTM X (east)	UTM Y (north)	UTM Correction	Location Verified	Comments
NMPM (NM)	12	7 62 478	39 38 810	No	Water Resources Management	REPEATED VIOLATION: The covers were not provided for the inlet/outlet of the chlorine tank container.

Received 8/15/05

File from Navajo EPA: z1-Inorganics.xls

Inorganic chemicals.

	A	B	C	D
1	PWSID#	PWS Name	Date Collected	Sample Location
2	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/28/1997	Mariano Lake West Well #2 (16T-596)
3	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/28/1997	Smith Lake Well #2 (16T-597)
4	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/28/1997	Mariano Lake East Well #1 (16T-595)
5	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	7/16/2001	Smith Lake Well #1 (16T-594)
6	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	7/16/2001	Smith Lake Well #2 (16T-597)
7	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	7/16/2001	Mariano Lake East Well #1 (16T-595)
8	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	7/16/2001	Mariano Lake West Well #2 (16T-596)
9	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	5/28/2003	Churchrock Well #1B (16T-538B)
10	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	5/28/2003	Churchrock East Well (16T-538E)
11	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	5/28/2003	Churchrock Well UNC (16T-538U)
12	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	5/28/2003	Churchrock East Well (16T-538E)
13	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	5/28/2003	Churchrock Well #1B (16T-538B)
14	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	5/28/2003	Churchrock Well UNC (16T-538U)
15	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	10/19/2003	Smith Lake Well.
16	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	12/1/2003	Smith Lake Well
17	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/9/2004	Smith Lake Well (16T-595)
18	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/9/2004	Smith Lake Well (16T-594)
19	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/9/2004	Smith Lake Well (16T-597)
20	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/9/2004	Smith Lake Well (16T-596)
21	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/17/2004	Mariano Lake Well #1 (16T-595)
22	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/17/2004	Mariano Lake Well #2 (16T-596)
23	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/17/2004	Smith Lake Well #2 (16T-597)
24	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/17/2004	Smith Lake Well #1 (16T-594)
25	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/18/2004	Mariano Lake Well (16T-595)
26	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/18/2004	Smith Lake Well (16T-597)
27	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/18/2004	Smith Lake Well (16T-594)
28	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	8/18/2004	Mariano Lake Well (16T-596)
29	3500254	BACA/HAYSTACK -O&M	11/10/1998	Haystack Well #1 (16T-551)
30	3503060	CASAMERO CUP -NTUA	11/7/1996	Casamero Cup Well #1 (16T-539)
31	3503060	CASAMERO CUP -NTUA	11/15/1999	Casamero Cup Well #1 (16T-539

Received 8/15/06

File from Navajo EPA: z1-Inorganics.xls Inorganic Chemicals.

	A	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	PWSID#	Laboratory Sample ID #	ND	Antimony	ND	Arsenic	ND	Barium	ND	Beryllium	ND	Cadmium	ND	Chromium	ND	Copper	ND
2	3500211	97D298	<	0.003	<	0.001		0.337	<	0.0002	<	0.0001		0.001		0.129	
3	3500211	97D299	<	0.003	<	0.001		0.145	<	0.0002	<	0.0001		0.001		0.052	
4	3500211	97D297		0.004		0.002		0.384	<	0.0002	<	0.0001		0.001		0.115	
5	3500211	01D274	<	0.003	<	0.001		0.479	<	0.0002	<	0.0001	<	0.001	<	0.02	
6	3500211	01D273	<	0.003		0.005		0.65	<	0.0002		0.0002	<	0.001		0.032	
7	3500211	01D276	<	0.003		0.001		0.227	<	0.0002	<	0.0001	<	0.001	<	0.02	
8	3500211	01D275	<	0.003		0.001		0.264	<	0.0002	<	0.0001	<	0.001		0.159	
9	3500211	WC-03-1987															<
10	3500211	WC-03-1986															<
11	3500211	03D38	<	0.003	<	0.005		0.329	<	0.0002	<	0.0002	<	0.001	<	0.02	
12	3500211	03D37	<	0.003	<	0.005		0.399	<	0.0002	<	0.0002	<	0.001	<	0.02	
13	3500211	03D36	<	0.003	<	0.005		0.345	<	0.0002	<	0.0002	<	0.001	<	0.02	
14	3500211	WC-03-1985															<
15	3500211	03D147															
16	3500211	03D174															
17	3500211	04D312	<	0.003	<	0.003	<	0.1	<	0.0002	<	0.0002	<	0.0002	<	0.02	
18	3500211	04D315		0.003	<	0.003	<	0.1	<	0.0002	<	0.0002	<	0.0002	<	0.02	
19	3500211	04D314	<	0.003		0.004		0.156	<	0.0002	<	0.0002	<	0.0002	<	0.02	
20	3500211	04D313	<	0.003	<	0.003	<	0.1	<	0.0002	<	0.0002	<	0.0002	<	0.02	
21	3500211	04081177-04F															<
22	3500211	04081177-05F															<
23	3500211	04081192															<
24	3500211	04081192															<
25	3500211	04D324															
26	3500211	04D323															
27	3500211	04D322															
28	3500211	04D325															
29	3500254	98D565	<	0.003	<	0.001		0.029	<	0.0002	<	0.0001		0.001	<	0.02	<
30	3503060	96D639	<	0.003	<	0.001		0.016	<	0.0002	<	0.0001		0.001	<	0.02	
31	3503060	99D338	<	0.003	<	0.001	<	0.03	<	0.0002	<	0.0001	<	0.001	<	0.02	

File from Navajo EPA: z1-Inorganics.xls

Inorganic chemicals.

	A	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
1	PWSID#	Cyanide	ND	Fluoride	ND	Lead	ND	Mercury	ND	Nickel	ND	Selenium	ND	Thallium	pH
2	3500211					0.018	<	0.0002	<	0.04		0.004	<	0.001	
3	3500211				<	0.001	<	0.0002	<	0.04		0.007	<	0.001	
4	3500211					0.004	<	0.0002	<	0.04		0.006	<	0.001	
5	3500211				<	0.001	<	0.0002	<	0.04	<	0.002	<	0.001	
6	3500211				<	0.001	<	0.0009	<	0.04	<	0.002	<	0.001	
7	3500211				<	0.001	<	0.0002	<	0.04	<	0.002	<	0.001	
8	3500211					0.006	<	0.0002	<	0.04	<	0.002	<	0.001	
9	3500211	0.1													
10	3500211	0.1													
11	3500211			1.1	<	0.001	<	0.0002	<	0.04	<	0.005	<	0.002	7.6
12	3500211			0.9	<	0.001	<	0.0002	<	0.04	<	0.005	<	0.002	7.6
13	3500211			1	<	0.001	<	0.0002	<	0.04	<	0.005	<	0.002	7.4
14	3500211	0.1													
15	3500211			1.2											
16	3500211			1.24											
17	3500211				<	0.001	<	0.0002	<	0.04	<	0.005	<	0.002	
18	3500211				<	0.001	<	0.0002	<	0.04	<	0.005	<	0.002	
19	3500211				<	0.001	<	0.0002	<	0.04	<	0.005	<	0.002	
20	3500211				<	0.001	<	0.0002	<	0.04	<	0.005	<	0.002	
21	3500211	0.02													
22	3500211	0.02													
23	3500211	0.02													
24	3500211	0.02													
25	3500211			0.69											7.7
26	3500211			0.412											7.1
27	3500211			0.269											7.1
28	3500211			0.226											8
29	3500254	0.005	ND		<	0.001	<	0.0002	<	0.04		0.003	<	0.001	9.2
30	3503060			1.6	<	0.001	<	0.0002	<	0.04		0.005		0.0014	8.4
31	3503060				<	0.001	<	0.0002	<	0.04	<	0.002	<	0.001	

Received 8/15/05

	A	B	C	D	E
1	PWSID#	PWS Name	Date Collected	Lab Sample ID	Location
2	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	11/07/1996	96D640	Smith Lake #2 (16T-597)
3	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	04/15/1997	97D158	Paul Davis Lee, Sr.
4	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	08/28/1997	97D304	Mariano Lake West #2 (16T-595)
5	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	08/28/1997	97D305	Mariano Lake East #1 (16T-596)
6	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	08/28/1997	97D306	Smith Lake #2 (16T-597)
7	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	09/10/1997	97D333	Smith Lake #1 (16T-594)
8	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	12/16/1998	98D707	Mariano Lake West #2 (16T-596)
9	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	12/16/1998	98D705	Smith Lake #2 (16T-597)
10	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	12/16/1998	98D706	Mariano Lake East #1 (16T-595)
11	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	11/15/1999	99D342	Mariano Lake East #1 (16T-595)
12	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	11/15/1999	99D340	Smith Lake #2 (16T-597)
13	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	11/15/1999	99D341	Mariano Lake West #2 (16T-596)
14	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	09/20/2000	WC-00-3541	Mariano Lake East #1 (16T-595)
15	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	09/20/2000	WC-00-3540	Mariano Lake West #2 (16T-596)
16	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	09/21/2000	WC-00-3527	Smith Lake #1 (16T-594)
17	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	09/25/2000	WC-00-3530	Smith Lake #2 (16T-597)
18	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	12/11/2000	00D544	Smith Lake #2 (16T-597)
19	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	05/09/2001	01D96	Mariano Lake West #2 (16T-596)
20	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	05/09/2001	01D89	Mariano Lake East #1 (16T-595)
21	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	08/01/2002	02N189	Churchrock Well B (16T-538B)
22	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	11/18/2002	02N217	Smith Lake #2 (16T-597)
23	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	11/18/2002	02N216	Smith Lake #1 (16T-594)
24	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	11/18/2002	02N214	Mariano Lake #1 (16T-595)
25	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	11/19/2002	02N215	Mariano Lake #2 (16T-596)
26	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	05/28/2003	WC-03-1979	Churchrock UNC Well (16T-538U)
27	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	05/28/2003	WC-03-1981	Mariano Lake Well #2 (16T-596)
28	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	05/28/2003	WC-03-1972	Mariano Lake Well #1 (16T-595)
29	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	05/28/2003	WC-03-1964	Smith Lake Well #1 (16T-594)
30	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	05/28/2003	WC-03-1974	Smith Lake Well #2 (16T-597)
31	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	05/28/2003	WC-03-1966	Churchrock Well "E" (16T-538E)
32	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	08/09/2004	04N164	Smith Lake Well (16T-594)
33	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	08/09/2004	04N158	Chruchrock Well (16T-538U)
34	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	08/09/2004	04N161	Mariano Lake Well (16T-595)

	A	F	G	H	I	J	K
1	PWSID#	ND	Nitrate	ND	Nitrite	ND	Total Nitrate/Nitrite
2	3500211	<	0.1	<	0.1		
3	3500211		0.57				
4	3500211		0.41	<	0.1		
5	3500211		0.59	<	0.1		
6	3500211	<	0.1	<	0.1		
7	3500211	<	0.1	<	0.1		
8	3500211		0.7	<	0.1		
9	3500211	<	0.1	<	0.1		
10	3500211		0.41	<	0.1		
11	3500211		0.4				
12	3500211	<	0.3				
13	3500211		0.4				
14	3500211						0.796
15	3500211						0.549
16	3500211					<	0.1
17	3500211						96.6
18	3500211					<	0.1
19	3500211		0.5	<	0.1		0.5
20	3500211		0.4	<	0.1		0.4
21	3500211		5.16				
22	3500211	<	0.3	<	0.3		
23	3500211	<	0.3	<	0.3		
24	3500211		0.36	<	0.3		
25	3500211		0.81	<	0.3		
26	3500211						4
27	3500211						0.56
28	3500211						0.34
29	3500211					<	0.1
30	3500211					<	0.1
31	3500211						4.9
32	3500211	<	0.3	<	0.3		
33	3500211		3	<	0.3		
34	3500211		0.34	<	0.3		

	A	B	C	D	E
1	PWSID#	PWS Name	Date Collected	Lab Sample ID	Location
35	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	08/09/2004	04N163	Smith Lake Well (16T-597)
36	3500211	SMITH LAKE/MARIANO LAKE/PINEDALE/CHURCH ROCK -NTUA	08/09/2004	04N162	Mariano Lake Well (16T-596)
37	3500254	BACA/HAYSTACK -O&M	09/22/1998	98D466	Haystack Well #1 (16T-551)
38	3500254	BACA/HAYSTACK -O&M	09/07/1999	99D208	Haystack Well #1 (16T-551)
39	3500254	BACA/HAYSTACK -O&M	12/04/2001	WC-01-5250	Haystack Well #1 (16T-551)
40	3500254	BACA/HAYSTACK -O&M	09/23/2003	03N206	Haystack Well (16T-551)
41	3500254	BACA/HAYSTACK -O&M	03/15/2004	04N29	Haystack Pump house WD
42	3500254	BACA/HAYSTACK -O&M	05/02/2005	05N84	(16T-551)
43	3503060	CASAMERO CUP -NTUA	11/07/1996	96D639	Casamero Cup #1 (16T-539)
44	3503060	CASAMERO CUP -NTUA	08/28/1997	97D307	Casamero Cup #1 (16T-539)
45	3503060	CASAMERO CUP -NTUA	12/16/1998	98D704	Casamero Cup #1 (16T-539)
46	3503060	CASAMERO CUP -NTUA	11/15/1999	99D338	Casamero Cup #1 (16T-539)
47	3503060	CASAMERO CUP -NTUA	09/21/2000	WC-00-3532	Casamero Cup #1 (16T-539)
48	3503060	CASAMERO CUP -NTUA	11/19/2002	02N206	Casamero Cup #1 (16T-539)
49	3503060	CASAMERO CUP -NTUA	05/28/2003	WC-03-1971	Casamero Cup Well (16T-539)
50	3503060	CASAMERO CUP -NTUA	08/09/2004	04N165	Casamero Cup Well (16T-539)

Received 8/15/05

	A	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
1	PWSID#	±	ND	sigma		ND	Gross Beta w/Cs-137	±	ND	sigma		ND	Gross Beta w/Sr90	±	ND	sigma		ND	Radium-226	±	ND	sigma		ND	Radium-228	±	ND	sigma	
2	3500211	±						±						±						±						±			
3	3500211	±						±						±					0.5	±		0.3				±			
4	3500211	±		1.9				±						±					0.7	±		0.3				±			
5	3500211	±		1.6				±						±					0.5	±		0.1		<	0.4	±			
6	3500211	±		0.7				±						±					0.8	±		0.1		<	0.5	±			
7	3500211	±		1.8				±						±					0.4	±		0.1		<	0.4	±			
8	3500211	±		2				±						±				<	0.3	±				<	0.4	±			
9	3500211	±		1.6				±						±					0.5	±		0.1		<	0.4	±			
10	3500211	±		2				±						±				<	0.3	±	<	0.4				±			
11	3500211	±		0.7				±						±					0.8	±		0.1		<	0.5	±			
12	3500211	±		1.8				±						±					0.4	±		0.1		<	0.4	±			
13	3500211	±		1.9				±						±					0.4	±		0.1		<	0.3	±			
14	3500211	±		2				±						±					0.7	±		0.1		<	0.3	±			
15	3500211	±		0.9				±						±					0.9	±		0.1			0.8	±		0.3	
16	3500211	±		1.8				±						±				<	0.3	±				<	0.3	±			
17	3500211	±		0.8				±						±					0.8	±		0.1		<	0.3	±			
18	3500254	±		0.6				±						±						±						±			
19	3500254	±		0.6				±						±						±						±			
20	3503060	±						±						±						±						±			
21	3503060	±		0.4				±						±						±						±			
22	3503060	±		0.5				±						±				<	0.2	±				<	0.3	±			
23	3503060	±		0.5				±						±				<	0.3	±				<	0.3	±			
24	3503060	±		1.4				±						±					0.5	±		0.1		<	0.3	±			
25	3503060	±		0.5				±						±				<	0.3	±				<	0.3	±			
26	3503060	±		0.7				±						±				<	0.2	±				<	0.3	±			
27	3503060	±		0.5				±						±				<	0.2	±				<	0.4	±			

	A	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA
1	PWSID#	ND	Combined Radium-226/-228	±	ND	1 sigma		ND	Radon	±	ND	1 sigma		ND	Uranium	±	ND	1 sigma
2	3500211			±						±						±		
3	3500211			±						±						±		
4	3500211			±						±						±		
5	3500211		0.5	±		0.1				±					10	±		0.8
6	3500211		0.8	±		0.1				±				<	0.6	±		
7	3500211		0.4	±		0.1				±					7.5	±		0.7
8	3500211	<	0.4	±						±					18	±		1.1
9	3500211		0.5	±		0.1				±					10	±		0.8
10	3500211			±		0.4				±					18	±		1.1
11	3500211		0.8	±		0.1				±					0.6	±		
12	3500211		0.4	±		0.1				±					7.5	±		0.7
13	3500211		0.4	±		0.1				±					13	±		0.9
14	3500211		0.7	±		0.1				±					15	±		1
15	3500211		1.7	±		0.3				±				<	0.4	±		
16	3500211	<	0.3	±						±					16	±		1
17	3500211		0.8	±		0.1				±				<	0.6	±		
18	3500254			±						±						±		
19	3500254			±						±						±		
20	3503060			±					280	±		52				±		
21	3503060			±						±						±		
22	3503060	<	0.3	±						±				<	0.6	±		
23	3503060	<	0.3	±						±				<	0.6	±		
24	3503060		0.5	±		0.1				±					3.1	±		0.4
25	3503060	<	0.3	±						±				<	0.6	±		
26	3503060	<	0.3	±						±				<	0.6	±		
27	3503060	<	0.4	±						±				<	0.6	±		

Received 8/15/05

REFERENCE 19

Ref 19

Analytical Results of Water Sample taken from Well #16T-551 in July 1989. Results were quoted over the phone by Tom Morris (Navajo Superfund) to Linda Fluk (NMED).

Metals were analyzed by atomic absorption. Concentrations are reported in mg/L.

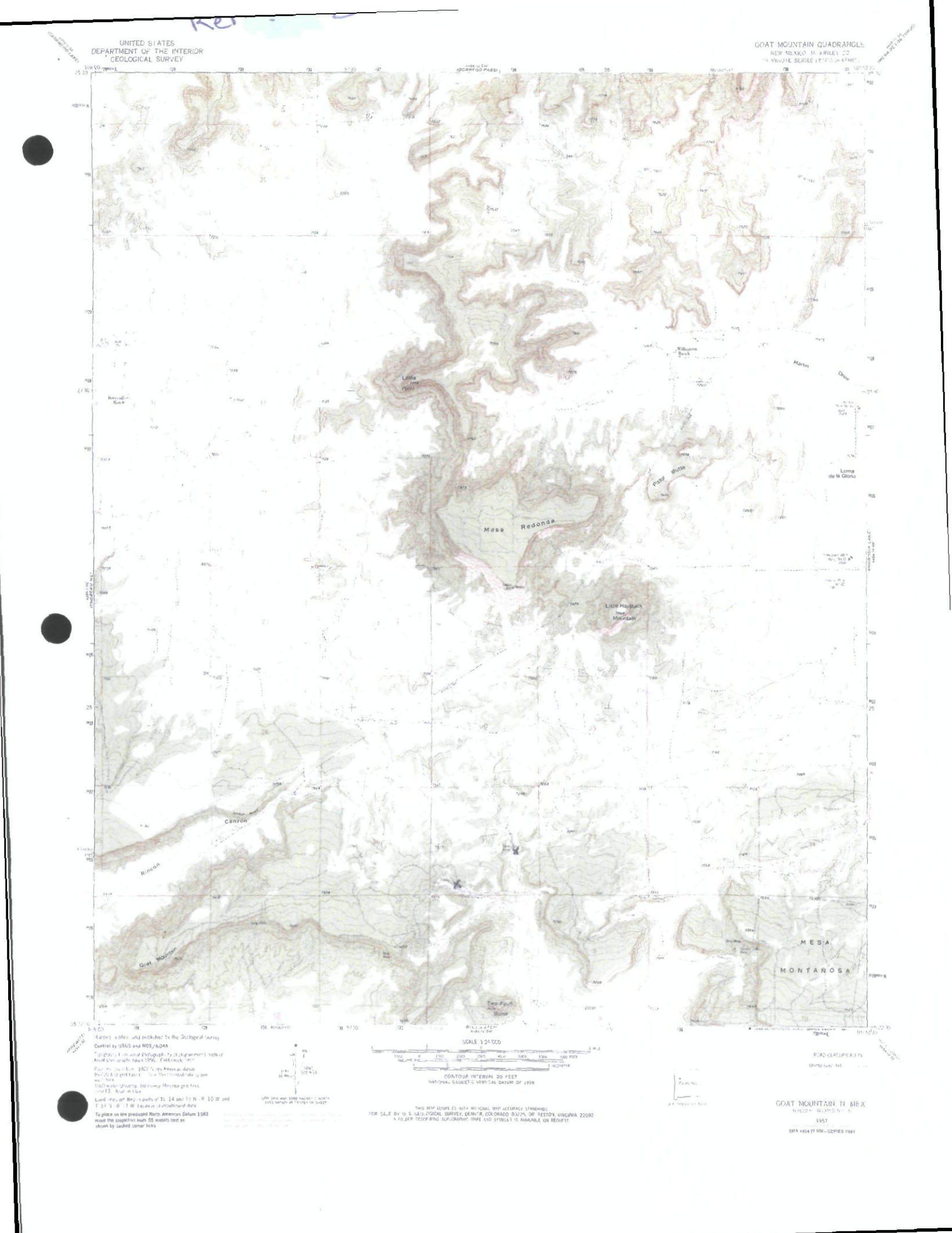
Sample #7116

constituent	concentration	MCL
Ar	<0.001	0.05
Ba	0.09	1.0
Cd	0.001	0.01
Cr	0.002	0.05
Fe	0.047	
Pb	0.003	0.05
Mn	0.008	
Hg	0.001	0.002
Se	0.007	0.01
Ag	<0.001	0.05

Radionuclides were analyzed by flameless atomic absorption. Concentrations are reported in pci/L.

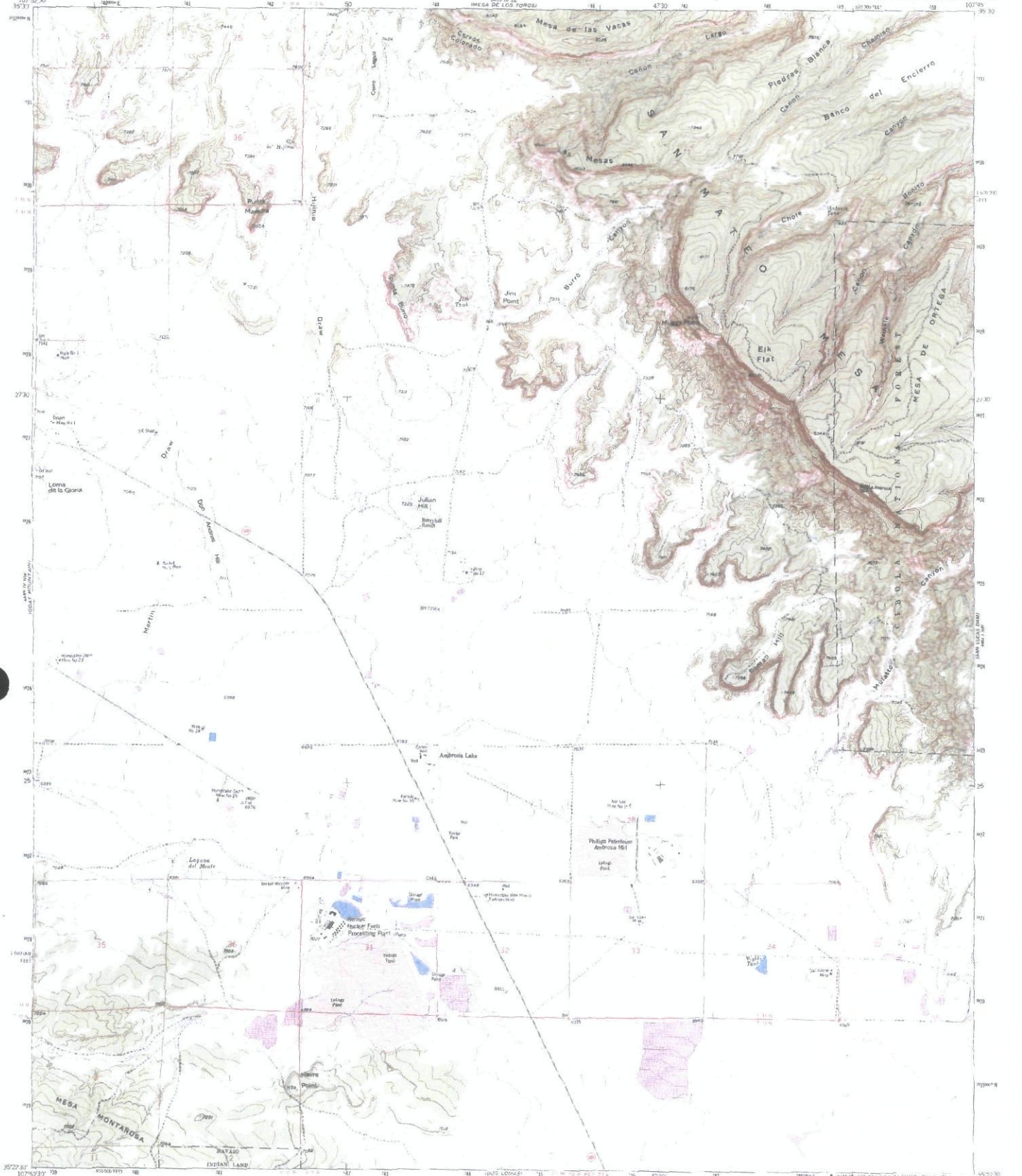
radionuclide	concentration	counting error	overall error
gross alpha	1.23 E1	5.16	5.99
Ra-226	4.19 E-1	1.15 E-1	1.36 E-1

REFERENCE 20


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
GOAT MOUNTAIN QUADRANGLE
NEW MEXICO—MCKINLEY CO
7.5 MINUTE SERIES (TOPOGRAPHIC)
Martin Draw
Lorna de la Gloria
Mesa Redonda
Little Haystack Mountain
Canyon
Rincon
Goat Mountain
MESA MONTAÑOSA
SCALE 1:24 000
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
GOAT MOUNTAIN, N. MEX.
1957

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

AMBROSIA LAKE QUADRANGLE
NEW MEXICO-MCKINLEY CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

Control by USGS and NOS/NOAA

Topography from aerial photographs by photogrammetric methods
Aerial photographs taken 1956. Field check 1957

Polyconic projection. 1927 North American datum
10,000-foot grid based on New Mexico coordinate system, west zone
1000-meter Universal Transverse Mercator grid ticks, zone 13, shown in blue

Dashed land lines indicate approximate locations
Land lines are omitted in T. 13 and 15 N., R. 9 W. and in parts of T. 14 N., Rs. 9 and 10 W. because of alleged fraud or defects in the surveys

To place on the predetermined North American Datum 1983 move the projection lines 65 meters east as shown by dashed ticks on this

SCALE 1:24 000

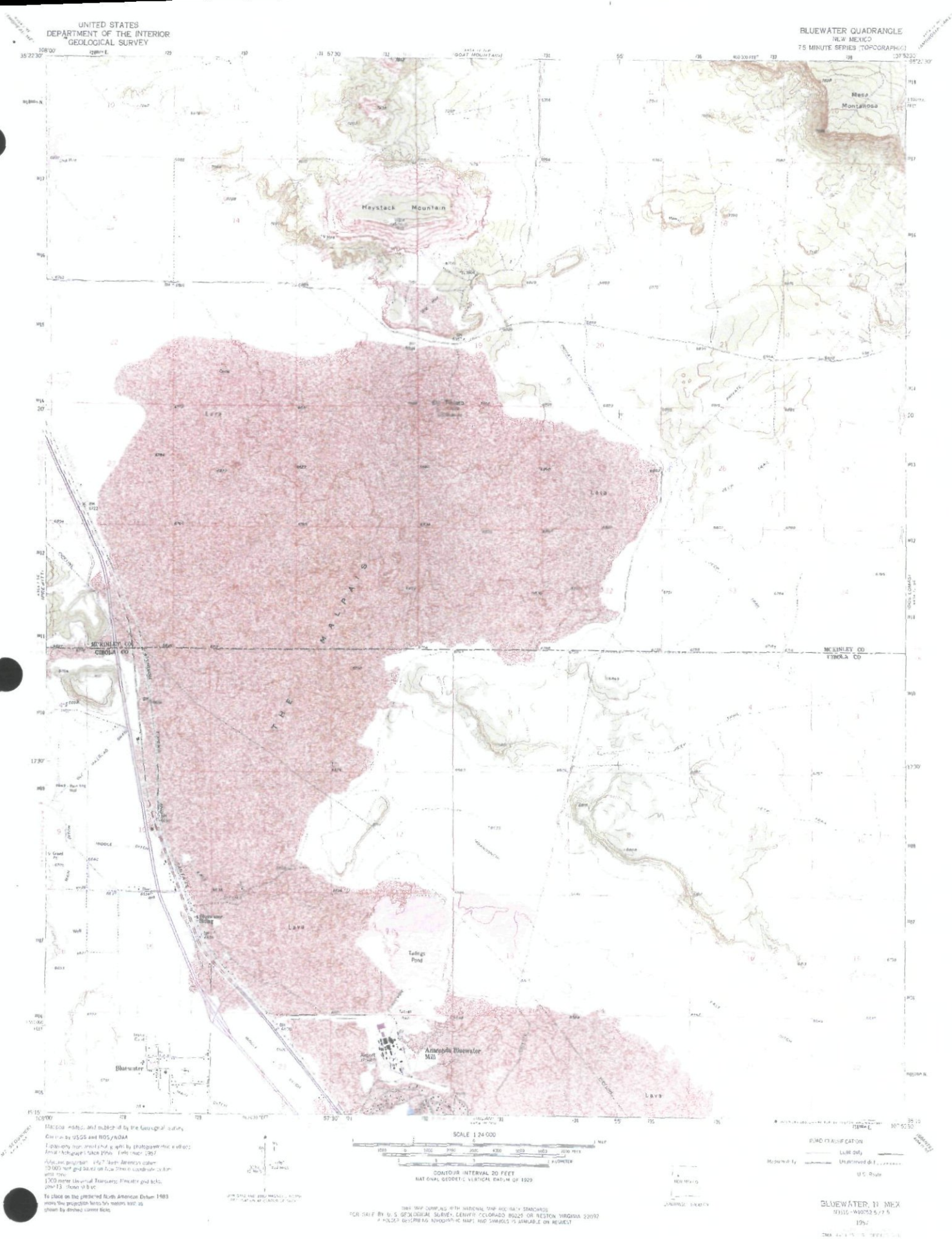
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

There may be private inholdings within the boundaries of the National or State reservations shown on this map

ROAD CLASSIFICATION
Medium duty ——— Light duty ———
Unimproved dirt - - - - - -
State Route

AMBROSIA LAKE, N. MEX.
N3522.5—W10745/7.5
1957
DMA 4454 IV NE—SERIES V881


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
BLUEWATER QUADRANGLE
NEW MEXICO
7.5 MINUTE SERIES (TOPOGRAPHIC)
Haystack Mountain
Mesa Montanosa
Lava
THE MALPAIS
MCKINLEY CO
CIBOLA CO
Lava
Tailings Pond
Anaconda Bluewater Mill
Bluewater
SCALE 1:24 000
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
ROAD CLASSIFICATION
Light duty
Unimproved dirt
U.S. Route
BLUEWATER, N. MEX.
1957


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
THOREAU NE QUADRANGLE
NEW MEXICO-MC KINLEY CO
7.5 MINUTE SERIES (TOPOGRAPHIC)
CASAMERO LAKE
Casamero
Draw
Mitchell
Draw
Casamero
Draw
Mitchell
Draw
ATCHISON, TOPEKA AND SANTA FE
ATCHISON, TOPEKA AND SANTA FE
SCALE 1:24 000
CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929
ROAD CLASSIFICATION
THOREAU NE, N MEX
1963

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

THOREAU QUADRANGLE
NEW MEXICO-MC KINLEY CO
7.5 MINUTE SERIES (TOPOGRAPHIC)

Mapped, edited, and published by the Geological Survey
Control by USGS and NOS/NOAA

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

ROAD CLASSIFICATION

THOREAU, N. MEX

1963

REFERENCE 21

Ref . . . 21

U.S. Census Bureau
American FactFinder

DP-1. **Profile of General Demographic Characteristics: 2000**
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data
Geographic Area: **McKinley County, New Mexico**

NOTE: For information on confidentiality protection, nonsampling error, and definitions, see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

Subject	Number	Percent
Total population	**74,798**	**100.0**
SEX AND AGE		
Male	36,146	48.3
Female	38,652	51.7
Under 5 years	6,833	9.1
5 to 9 years	8,274	11.1
10 to 14 years	8,577	11.5
15 to 19 years	7,150	9.6
20 to 24 years	4,848	6.5
25 to 34 years	9,777	13.1
35 to 44 years	11,029	14.7
45 to 54 years	8,149	10.9
55 to 59 years	2,755	3.7
60 to 64 years	2,246	3.0
65 to 74 years	3,053	4.1
75 to 84 years	1,521	2.0
85 years and over	586	0.8
Median age (years)	26.9	(X)
18 years and over	46,387	62.0
Male	21,888	29.3
Female	24,499	32.8
21 years and over	42,991	57.5
62 years and over	6,466	8.6
65 years and over	5,160	6.9
Male	2,223	3.0
Female	2,937	3.9
RACE		
One race	72,916	97.5
White	12,257	16.4
Black or African American	296	0.4
American Indian and Alaska Native	55,892	74.7
Asian	344	0.5
Asian Indian	115	0.2
Chinese	57	0.1
Filipino	70	0.1
Japanese	35	0.0
Korean	21	0.0
Vietnamese	4	0.0
Other Asian [1]	42	0.1
Native Hawaiian and Other Pacific Islander	32	0.0
Native Hawaiian	7	0.0
Guamanian or Chamorro	3	0.0
Samoan	10	0.0
Other Pacific Islander [2]	12	0.0

Subject	Number	Percent
Some other race	4,095	5.5
Two or more races	1,882	2.5
Race alone or in combination with one or more other races [3]		
White	13,585	18.2
Black or African American	518	0.7
American Indian and Alaska Native	57,126	76.4
Asian	477	0.6
Native Hawaiian and Other Pacific Islander	64	0.1
Some other race	5,021	6.7
HISPANIC OR LATINO AND RACE		
Total population	**74,798**	**100.0**
Hispanic or Latino (of any race)	9,276	12.4
Mexican	4,729	6.3
Puerto Rican	34	0.0
Cuban	8	0.0
Other Hispanic or Latino	4,505	6.0
Not Hispanic or Latino	65,522	87.6
White alone	8,902	11.9
RELATIONSHIP		
Total population	**74,798**	**100.0**
In households	73,939	98.9
Householder	21,476	28.7
Spouse	10,239	13.7
Child	30,800	41.2
Own child under 18 years	22,919	30.6
Other relatives	8,907	11.9
Under 18 years	5,164	6.9
Nonrelatives	2,517	3.4
Unmarried partner	1,681	2.2
In group quarters	859	1.1
Institutionalized population	569	0.8
Noninstitutionalized population	290	0.4
HOUSEHOLDS BY TYPE		
Total households	**21,476**	**100.0**
Family households (families)	16,679	77.7
With own children under 18 years	9,884	46.0
Married-couple family	10,239	47.7
With own children under 18 years	6,127	28.5
Female householder, no husband present	4,866	22.7
With own children under 18 years	2,810	13.1
Nonfamily households	4,797	22.3
Householder living alone	4,184	19.5
Householder 65 years and over	1,139	5.3
Households with individuals under 18 years	11,800	54.9
Households with individuals 65 years and over	3,922	18.3
Average household size	3.44	(X)
Average family size	3.99	(X)
HOUSING OCCUPANCY		
Total housing units	**26,718**	**100.0**
Occupied housing units	21,476	80.4
Vacant housing units	5,242	19.6
For seasonal, recreational, or occasional use	1,870	7.0
Homeowner vacancy rate (percent)	1.4	(X)
Rental vacancy rate (percent)	6.8	(X)

Subject HOUSING TENURE	Number	Percent
Occupied housing units	**21,476**	**100.0**
Owner-occupied housing units	15,544	72.4
Renter-occupied housing units	5,932	27.6
Average household size of owner-occupied unit	3.53	(X)
Average household size of renter-occupied unit	3.21	(X)

(X) Not applicable
[1] Other Asian alone, or two or more Asian categories.
[2] Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.
[3] In combination with one or more other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.
Source: U.S. Census Bureau, Census 2000 Summary File 1, Matrices P1, P3, P4, P8, P9, P12, P13, P,17, P18, P19, P20, P23, P27, P28, P33, PCT5, PCT8, PCT11, PCT15, H1, H3, H4, H5, H11, and H12.

DP-1. **Profile of General Demographic Characteristics: 2000**
Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data
Geographic Area: **Navajo Nation Reservation and Off-Reservation Trust Land, AZ--NM--UT (NM part)**

NOTE: For information on confidentiality protection, nonsampling error, and definitions, see http://factfinder.census.gov/home/en/datanotes/expsf1u.htm.

Subject	Number	Percent
Total population	**69,524**	**100.0**
SEX AND AGE		
Male	33,863	48.7
Female	35,661	51.3
Under 5 years	6,510	9.4
5 to 9 years	8,179	11.8
10 to 14 years	8,619	12.4
15 to 19 years	7,228	10.4
20 to 24 years	4,680	6.7
25 to 34 years	8,732	12.6
35 to 44 years	9,740	14.0
45 to 54 years	6,690	9.6
55 to 59 years	2,416	3.5
60 to 64 years	2,116	3.0
65 to 74 years	2,835	4.1
75 to 84 years	1,309	1.9
85 years and over	470	0.7
Median age (years)	24.5	(X)
18 years and over	41,482	59.7
Male	19,795	28.5
Female	21,687	31.2
21 years and over	38,011	54.7
62 years and over	5,840	8.4
65 years and over	4,614	6.6
Male	1,971	2.8
Female	2,643	3.8
RACE		
One race	69,042	99.3
White	1,340	1.9
Black or African American	55	0.1

Subject	Number	Percent
American Indian and Alaska Native	67,397	96.9
Asian	34	0.0
Asian Indian	14	0.0
Chinese	8	0.0
Filipino	3	0.0
Japanese	1	0.0
Korean	5	0.0
Vietnamese	0	0.0
Other Asian [1]	3	0.0
Native Hawaiian and Other Pacific Islander	11	0.0
Native Hawaiian	3	0.0
Guamanian or Chamorro	0	0.0
Samoan	2	0.0
Other Pacific Islander [2]	6	0.0
Some other race	205	0.3
Two or more races	482	0.7
Race alone or in combination with one or more other races [3]		
White	1,658	2.4
Black or African American	116	0.2
American Indian and Alaska Native	67,834	97.6
Asian	44	0.1
Native Hawaiian and Other Pacific Islander	26	0.0
Some other race	346	0.5
HISPANIC OR LATINO AND RACE		
Total population	**69,524**	**100.0**
Hispanic or Latino (of any race)	1,029	1.5
Mexican	486	0.7
Puerto Rican	15	0.0
Cuban	0	0.0
Other Hispanic or Latino	528	0.8
Not Hispanic or Latino	68,495	98.5
White alone	1,148	1.7
RELATIONSHIP		
Total population	**69,524**	**100.0**
In households	69,521	100.0
Householder	18,573	26.7
Spouse	8,730	12.6
Child	31,104	44.7
Own child under 18 years	22,400	32.2
Other relatives	9,009	13.0
Under 18 years	5,439	7.8
Nonrelatives	2,105	3.0
Unmarried partner	1,505	2.2
In group quarters	3	0.0
Institutionalized population	0	0.0
Noninstitutionalized population	3	0.0
HOUSEHOLDS BY TYPE		
Total households	**18,573**	**100.0**
Family households (families)	14,955	80.5
With own children under 18 years	9,085	48.9
Married-couple family	8,730	47.0
With own children under 18 years	5,638	30.4
Female householder, no husband present	4,685	25.2
With own children under 18 years	2,539	13.7
Nonfamily households	3,618	19.5
Householder living alone	3,277	17.6
Householder 65 years and over	999	5.4
Households with individuals under 18 years	11,030	59.4

Subject	Number	Percent
Households with individuals 65 years and over	3,743	20.2
Average household size	3.74	(X)
Average family size	4.27	(X)
HOUSING OCCUPANCY		
Total housing units	**25,384**	**100.0**
Occupied housing units	18,573	73.2
Vacant housing units	6,811	26.8
For seasonal, recreational, or occasional use	2,921	11.5
Homeowner vacancy rate (percent)	1.0	(X)
Rental vacancy rate (percent)	4.4	(X)
HOUSING TENURE		
Occupied housing units	**18,573**	**100.0**
Owner-occupied housing units	14,418	77.6
Renter-occupied housing units	4,155	22.4
Average household size of owner-occupied unit	3.72	(X)
Average household size of renter-occupied unit	3.84	(X)

(X) Not applicable
[1] Other Asian alone, or two or more Asian categories.
[2] Other Pacific Islander alone, or two or more Native Hawaiian and Other Pacific Islander categories.
[3] In combination with one or more other races listed. The six numbers may add to more than the total population and the six percentages may add to more than 100 percent because individuals may report more than one race.
Source: U.S. Census Bureau, Census 2000 Summary File 1, Matrices P1, P3, P4, P8, P9, P12, P13, P,17, P18, P19, P20, P23, P27, P28, P33, PCT5, PCT8, PCT11, PCT15, H1, H3, H4, H5, H11, and H12.

REFERENCE 22

Public Water System Supervision Program

Navajo Nation Environmental Protection Agency

Home
PWS
Staff
Calendar
Inspections
Primacy
Monitoring
Regulations
Permitting
Notification
X-Connection
Prevention
Operator
Livestock
Training
Conference

Navajo Nation Primary Drinking Water Regulations

Page Title Here

2004 NNPDWR

The revised Navajo Nation Primary Drinking Water Regulations (NNPDWR) was formally adopted by the Resources Committee of the Navajo Nation Council, Navajo EPA's legislative oversight. The NNPDWR continues to be amended to address concerns over risks associated with drinking water.

100: Introduction
200: Maximum Contaminant Levels; new regulations will include arsenic MCL, uranium MCL and changes to the radionuclide section.
300: Sanitary Survey section that outlines the protocol for conducting a survey.
400: Sampling and Analytical Requirements
500: Reporting and Recordkeeping
600: New Public Notification Requirements as required by the amended SDWA of 1996.
700: Lead and Copper with revisions as required by the amended SDWA of 1996.
800: Surface Water Treatment with revisions as required by the amended SDWA of 1996.
900: Use of Non-Centralized Treatment Devices
1000: Treatment Techniques
1100: Disinfectant By-Products as required by the amended SDWA of 1996.
1200: Consumer Confidence Report with minor modifications/revisions.
1300: Enhanced Surface Water Treatment as required by the amended SDWA of 1996.
1400: Public Water System Operator Certification
1500: Minimum Design Regulations
1600: Construction Permit
1700: Wellhead Protection
1800: Secondary Drinking Water Standards
1900: Consecutive Public Water Systems
2000: Cross Connection and Backflow Prevention

Navajo Nation Seal

Fifty outward pointing arrowheads form the outer edge of the seal. Inside this are three bands of the rainbow. They are open at the top, as is the ring of arrowheads. This open area at the top signifies life. Inside the rainbow are two stalks of corn. Corn signifies many important things in the Navajo culture. The whole teaching of our ceremonial system is all in a stock of corn which symbolizes life. In the main stock of the corn there is a blessing waiting. The leaves that come off the corn

from : http://www.navajopublicwater.org/02aNNPDWR200part

PART II
MAXIMUM CONTAMINANT LEVELS

§ 201 PURPOSE

The purpose of this part is to define the Maximum Contaminant Levels, or MCL, for each contaminant.

§ 202 SPECIAL MAXIMUM CONTAMINANT LEVELS for ARSENIC and NITRATE

A. The MCL for arsenic of 0.010 mg/L or 10 parts per billion (10ppb) applies to community water systems and non-transient, non-community water systems and shall become effective January 23, 2006.

1. The owner/operator shall submit a plan to comply with the arsenic MCL of 0.010 mg/L by July 01, 2003.

2. The owner/operator shall submit a treatment plan for community water systems that exceed the arsenic MCL of 0.010 mg/L.

3. Compliance with the MCL for arsenic is calculated pursuant to § 405.

4. The owner/operator shall report the most recent arsenic levels in their water systems. These levels and health effects shall be reported in the Consumer Confidence Reports required by Part XII of these regulations.

B. The MCL for nitrate is 10mg/L or 10 parts per million (10ppm).

C. At the discretion of the Director, nitrate levels not exceeding 20 mg/L may be allowed in a non-community water system if the public water system owner or operator demonstrates to the satisfaction of the Director that:

1. Such water will not be available to children under six months of age;

2. There will be continuous public notification stating that nitrate levels exceed 10 mg/L and lists the potential health effects due to exposure;

3. PWSSP shall be notified annually of nitrate levels that exceed 10 mg/L; and

4. No adverse health effects shall result.

§ 203 MAXIMUM CONTAMINANT LEVELS and MAXIMUM CONTAMINANT LEVEL GOALS FOR INORGANIC CONTAMINANTS

A. Applicability

1. The MCLs for inorganic contaminants (1)-(10), (12)-(13), and (17)-

(18) of Table 200.1 applies to community water systems (CWS) and non-transient, non-community water systems (NTNCWS).

2. The MCL specified in (11) of Table 200.1 only applies to CWSs.

3. The MCLs specified in (14)-(16) of Table 200.1 apply to CWSs; NTNCWSs; and transient non-community water systems (TNCWS).

4. The MCLs specified in (14), (15) and (16) of Table 200.1 apply to consecutive public water systems. Other MCL sampling requirements will be determined, by the Director, after a sanitary survey of the system, a wellhead protection delineation or a vulnerability assessment survey indicates that further sampling requirements are needed. MCL sampling for asbestos (4) is required for those systems with asbestos-cement pipe in the distribution system.

5. BAT(s) are the best available technology, treatment technique, or other means available for achieving compliance with the MCLs for inorganic contaminants and are identified in Table 200.1.

TABLE 200.1 MAXIMUM CONTAMINANT LEVELS, MAXIMUM CONTAMINANT LEVEL GOALS with EFFECTIVE DATES for INORGANIC CONTAMINANTS

#	EFFECTIVE DATE	CONTAMINANT	MCL mg/L	MCLG mg/L	BATs
1	3/21/1996	Antimony	0.006	0.006	2,7
2	3/21/1996	Arsenic[4]	0.05	Zero	1,2,5,6,7,9,12[5]
3	1/23/2006	Arsenic[4]	0.010[6]	Zero	1,2,5,6,7,9,12[5]
4	3/21/1996	Asbestos	7 million fibers/liter (longer than 10µm)	7 million fibers/liter (longer than 10µm)	2,3,8
5	3/21/1996	Barium	2	2	5,6,7,9
6	3/21/1996	Beryllium	0.004	0.004	1,2,5,6,7
7	3/21/1996	Cadmium	0.005	0.005	2,5,6,7
8	3/21/1996	Chromium	0.1	0.1	2,5,6[2], 7
9	3/21/1996	Copper		1.3	
10	3/21/1996	Cyanide (as free cyanide)	0.2	0.2	5,7,10
11	3/21/1996	Fluoride	4.0	4.0	
12	3/21/1996	Lead	0.015	Zero	

13	3/21/1996	Mercury	0.002	0.002	2[1],4,6[1],7[1]
14	3/21/1996	Nitrate	10 (as Nitrogen)	10 (as Nitrogen)	5,7,9
15	3/21/1996	Nitrite	1 (as Nitrogen)	1 (as Nitrogen)	5,7
16	3/21/1996	Total Nitrate and Nitrite	10 (as Nitrogen)	10 (as Nitrogen)	
17	3/21/1996	Selenium	0.05	0.05	1,2[3],6,7,9
18	3/21/1996	Thallium	0.002	0.0005	1,5

[1] BAT only if influent Hg concentrations ≤10 micrograms/liter.
[2] BAT for Chromium III only.
[3] BAT for Selenium IV only.
[4] BATs for Arsenic V. Pre-oxidation may be required to convert Arsenic III to Arsenic V.
[5] To obtain high removals, iron to arsenic ratio must be at least 20:1.
[6] This MCL will replace the 0.05 mg/L MCL and will apply to CWS and NTNCWS, effective January 23, 2006.

Key to BAT(s) in Table 200.1

1 = Activated Alumina	5 = Ion Exchange	9 = Electrodialysis
2 = Coagulation/Filtration	6 = Lime Softening	10= Chlorine
3 = Direct & Diatomite Filtration	7 = Reverse Osmosis	11= Ultraviolet
4 = Granular Activated Carbon	8 = Corrosion Control	12= Oxidation / Filtration

6. The Administrator, pursuant to section 1412 of the Act, hereby identifies the following table the affordable technology, treatment technique or other means available to systems serving 10,000 persons or fewer for achieving compliance with the maximum contaminant level for arsenic:

TABLE 200.2 SMALL SYSTEM COMPLIANCE TECHNOLOGIES (SSCTS)[1] FOR ARSENIC[2]

Small system compliance technology	Affordable for listed small system categories[3]
Activated Alumina (centralized)	All size categories.
Activated Alumina (Point-of-Use)[4]	All size categories.
Coagulation/Filtration[5]	501-3,300 and 3,301-10,000.
Coagulation-assisted Micro-filtration	501-3,300 and 3,301-10,000.
Electrodialysis reversal[6]	501-3,300 and 3,301-10,000.
Enhanced coagulation/Filtration	All size categories.
Enhanced lime softening (pH>10.5)	All size categories.
Ion Exchange	All size categories.
Lime Softening	501-3,300 and 3,301-10,000.
Oxidation/Filtration[7]	All size categories.
Reverse Osmosis (centralized)[6]	501-3,300 and 3,301-10,000.
Reverse Osmosis (Point-of-Use)[4]	All size categories.

[1] Section 1412 (b)(4)(E)(ii) of the SDWA specifies that SSCTs must be affordable and technically feasible for small systems.
[2] SSCTs for Arsenic V. Pre-oxidation may be required to convert Arsenic III to Arsenic V.
[3] The Act (ibid.) Specifies three categories of small systems; (i) those serving 25 or more, but fewer than 501, (ii)

those serving more than 500, but fewer than 3,301, and (iii) those serving more than 3,300 but fewer than 10,001.
[4]When POU or POE devices are used for compliance, programs to ensure proper long-term operation, maintenance, and monitoring must be provided by the water system to ensure adequate performance.
[5]Unlikely to be installed solely for arsenic removal. May require pH adjustment to optimal range if high removals are needed.
[6]Technologies reject a large volume of water, may not be appropriate for areas where water quantity may be an issue.
[7]To obtain high removals, iron to arsenic ratio must be at least 20:1.

§ 204 MAXIMUM CONTAMINANT LEVELS and MAXIMUM CONTAMINANT LEVEL GOALS FOR ORGANIC CONTAMINANTS

A. Applicability

1. The following MCLs for organic contaminants apply to CWSs and NTNCWSs.

TABLE 200.3 MAXIMUM CONTAMINANT LEVELS and MAXIMUM CONTAMINANT LEVEL GOALS for VOLATILE ORGANIC CHEMICALS with EFFECTIVE DATES

#	CAS[1] No.	EFFECTIVE DATES	CONTAMINANT	MCL mg/L	MCLG mg/L
1	75-01-4	3/21/1996	Vinyl chloride	0.002	0.00
2	71-43-2	3/21/1996	Benzene	0.005	0.00
3	56-23-5	3/21/1996	Carbon tetrachloride	0.005	0.00
4	107-06-2	3/21/1996	1,2-Dichloroethane	0.005	0.00
5	79-01-6	3/21/1996	Trichloroethylene	0.005	0.00
6	106-46-7	3/21/1996	para-Dichlorobenzene	0.075	0.075
7	75-35-4	3/21/1996	1,1-Dichloroethylene	0.007	0.007
8	71-55-6	3/21/1996	1,1,1-Trichloroethane	0.2	0.20
9	156-59-2	3/21/1996	cis-1,2-Dichloroethylene	0.07	0.07
10	78-87-5	3/21/1996	1,2-Dichloropropane	0.005	0.00
11	100-41-4	3/21/1996	Ethylbenzene	0.7	0.7
12	108-90-7	3/21/1996	Monochlorobenzene	0.1	0.1
13	95-50-1	3/21/1996	o-Dichlorobenzene	0.6	0.6
14	100-42-5	3/21/1996	Styrene	0.1	0.1
15	127-18-4	3/21/1996	Tetrachloroethylene	0.005	0.00
16	108-88-3	3/21/1996	Toluene	1	1
17	156-60-5	3/21/1996	trans-1,2-Dichloroethylene	0.1	0.1
18	1330-20-7	3/21/1996	Xylenes (total)	10	10

19	75-09-2	3/21/1996	Dichloromethane	0.005	0.00
20	120-82-1	3/21/1996	1,2,4-Trichlorobenzene	0.07	0.07
21	79-00-5	3/21/1996	1,1,2-Trichloroethane	0.005	0.003

'Chemical Abstract Service Number

2. The following MCLs and MCLGs for synthetic organic contaminants apply to CWSs and NTNCWS.

TABLE 200.4 MAXIMUM CONTAMINANT LEVELS, MAXIMUM CONTAMINANT LEVEL GOALS with EFFECTIVE DATES for SYNTHETIC ORGANIC CHEMICALS

#	CAS No.	EFFECTIVE DATES	CONTAMINANT	MCL mg/L	MCLG mg/L
1	15972-60-8	3/21/1996	Alachlor	0.002	0.00
2	116-06-3	3/21/1996	Aldicarb	0.003	0.001
3	1646-87-3	3/21/1996	Aldicarb sulfoxide	0.004	0.001
4	1646-87-4	3/21/1996	Aldicarb sulfone	0.002	0.001
5	1912-24-9	3/21/1996	Atrazine	0.003	0.003
6	1563-66-2	3/21/1996	Carbofuran	0.04	0.04
7	57-74-9	3/21/1996	Chlordane	0.002	0.00
8	96-12-8	3/21/1996	Dibromochloropropane	0.0002	0.00
9	94-75-7	3/21/1996	2,4-D	0.07	0.07
10	106-93-4	3/21/1996	Ethylene dibromide	0.00005	0.00
11	76-44-8	3/21/1996	Heptachlor	0.0004	0.00
12	1024-57-3	3/21/1996	Heptachlor epoxide	0.0002	0.00
13	58-89-9	3/21/1996	Lindane	0.0002	0.0002
14	72-43-5	3/21/1996	Methoxychlor	0.04	0.04
15	1336-36-3	3/21/1996	Polychlorinated biphenyls	0.0005	0.00
16	87-86-5	3/21/1996	Pentachlorophenol	0.001	0.00
17	8001-35-2	3/21/1996	Toxaphene	0.003	0.00
18	93-72-1	3/21/1996	2,4,5-TP	0.05	0.05
19	50-32-8	3/21/1996	Benzo[a]pyrene	0.0002	0.00

20	75-99-0	3/21/1996	Dalapon	0.2	0.2
21	103-23-1	3/21/1996	Di(2-ethylhexyl)adipate	0.4	0.4
22	117-81-7	3/21/1996	Di(2-ethylhexyl)phthalate	0.006	0.00
23	88-85-7	3/21/1996	Dinoseb	0.007	0.007
24	85-00-7	3/21/1996	Diquat	0.02	0.02
25	145-73-3	3/21/1996	Endothall	0.1	0.1
26	72-20-8	3/21/1996	Endrin	0.002	0.002
27	1071-83-6	3/21/1996	Glyphosate	0.7	0.7
28	118-74-1	3/21/1996	Hexachlorobenzene	0.001	0.00
29	77-47-4	3/21/1996	Hexachlorocyclopentadiene	0.05	0.05
30	23135-22-0	3/21/1996	Oxamyl (Vydate)	0.2	0.2
31	1918-02-1	3/21/1996	Picloram	0.5	0.5
32	122-34-9	3/21/1996	Simazine	0.004	0.004
33	1746-01-6	3/21/1996	2,3,7,8-TCDD (Dioxin)	$3x10^{-8}$	0.00

B. The Administrator pursuant to §1412 of the SDWA has identified as indicated in Table 200.5 the granular activated carbon (GAC), packed tower aeration (PTA), or oxidation (OX) techniques as the best technology treatment technique or other means available for achieving compliance with the MCL for organic contaminants identified in subsections (A)(1) and (A)(2)of this section:

TABLE 200.5 BAT FOR ORGANIC CONTAMINANTS (SYNTHETIC AND VOLATILE)

#	CAS No.	CONTAMINANT	GAC	PTA	OX
1.	15972-60-8	Alachlor	X		
2.	116-06-3	Aldicarb	X		
3	1646-88-4	Aldicarb sulfone	X		
4	1646-87-3	Aldicarb sulfoxide	X		
5	1912-24-9	Atrazine	X		
6	71-43-2	Benzene	X	X	
7	50-32-8	Benzo[a]pyrene	X		

8	1563-66-2	Carbofuran	X		
9	56-23-5	Carbon tetrachloride	X	X	
10	57-74-9	Chlordane	X		
11	75-99-0	Dalapon	X		
12	94-75-7	2,4-D	X		
13	103-23-1	Di(2-ethylhexyl)adipate	X	X	
14	117-81-7	Di(2-ethylhexyl)phthalate	X		
15	96-12-8	Dibromochloroproprane (DBCP)	X	X	
16	95-50-1	o-Dichlorobenzene	X	X	
17	106-46-7	para-Dichlorobenzene	X	X	
18	107-06-2	1,2-Dichloroethane	X	X	
19	75-35-4	1,1-Dichloroethylene	X	X	
20	156-59-2	cis-1,2-Dichloroethylene	X	X	
21	156-60-5	trans-1,2-Dichloroethylene	X	X	
22	75-09-2	Dichloromethane		X	
23	78-87-5	1,2-Dichloropropane	X	X	
24	88-85-7	Dinoseb	X		
25	85-00-7	Diquat	X		
26	145-73-3	Endothall	X		
27	72-20-8	Endrin	X		
28	100-41-4	Ethylbenzene	X	X	
29	106-93-4	Ethylene Dibromide (EDB)	X	X	
30	1071-83-6	Glyphosate			X
31	76-44-8	Heptachlor	X		
32	1024-57-3	Heptachlor epoxide	X		
33	118-74-1	Hexachlorobenzene	X		
34	77-47-3	Hexachlorocyclopentadiene	X	X	

35	58-89-9	Lindane	X		
36	72-43-5	Methoxychlor	X		
37	108-90-7	Monochlorobenzene	X	X	
38	23135-22-0	Oxamyl (Vydate)	X		
39	87-86-5	Pentachlorophenol	X		
40	1918-02-1	Picloram	X		
41	1336-36-3	Polychlorinated biphenyls	X		
42	122-34-9	Simazine	X		
43	100-42-5	Styrene	X	X	
44	1746-01-6	2,3,7,8-TCDD (Dioxin)	X		
45	127-18-4	Tetrachloroethylene	X	X	
46	108-88-3	Toluene	X	X	
47	8001-35-2	Toxaphene	X		
48	93-72-1	2,4,5-TP (Silvex)	X		
49	120-82-1	1,2,4-Trichlorobenzene	X	X	
50	71-55-6	1,1,1-Trichloroethane	X	X	
51	79-00-5	1,1,2-Trichloroethane	X	X	
52	79-01-6	Trichloroethylene	X	X	
53	75-01-4	Vinyl chloride		X	
54	1330-20-7	Xylene	X	X	

§ 205 MAXIMUM CONTAMINANT LEVELS and MAXIMUM CONTAMINANT LEVEL GOALS FOR MICROBIOLOGICAL CONTAMINANTS

A. A public water system must determine compliance with the MCL for total coliforms in subsections (B) and (C) of this section for each month in which it is required to monitor for total coliforms.

B. Applicability

1. Each CWS, NTNCWS, TNCWS and Consecutive system is required to comply with this section. The MCL for total coliform is based on the presence or absence in a sample, rather than coliform density.

TABLE 200.6 MAXIMUM CONTAMINANT LEVELS and MAXIMUM CONTAMINANT LEVEL GOALS

FOR MICROBIOLOGICAL CONTAMINANTS

#	CONTAMINANT	MCL	MCLG
1	*Giardia lamblia*	zero	zero
2	Viruses	zero	zero
3	*Legionella*	zero	zero
4	Total coliforms (including fecal coliforms and *Escherichia coli*)	zero	zero
5	Cryptosporidium	zero	zero

C. Compliance

1. For a system that collects 40 or more samples per month, the system is in compliance with the MCL for total coliforms if no more than 5.0% of the samples collected during the month are total coliform-positive.

2. For a system that collects less than 40 samples per month, the system is in compliance with the MCL for total coliforms if no more than one sample collected during the month is total coliform-positive.

3. Any fecal coliform-positive repeat sample or E.*coli*-positive repeat sample, or any total coliform-positive repeat sample following a fecal coliform-positive or E-*coli*-positive routine sample constitutes a violation of the MCL for total coliforms. For purposes of the public notification requirements in Part VI, this is a violation that may pose an acute risk to health.

D. The following are identified as the best available technology, treatment techniques, or other means to achieve compliance with the MCL for total coliforms in subsections (B) and (C) of this section:

1. Protection of wells from total coliform contamination by appropriate construction and location;

2. Maintain a disinfectant residual throughout the distribution system;

3. Proper maintenance of the distribution system including appropriate pipe replacement and repair procedures, adequate flushing programs, proper operation and maintenance of storage tanks and reservoirs, and continual maintenance of positive water pressure in all parts of the distribution system;

4. Filtration and/or disinfection of surface water, as described in Parts VIII and XIII (General Requirements for Surface Water Treatment and Enhanced Surface Water Treatment), or disinfection of groundwater using strong oxidants such as chlorine, chlorine

dioxide, or ozone;

5. Compliance with the requirements of an NNEPA-approved Wellhead Protection Program that is developed and implemented pursuant to § 308 of the NNSDWA and Part XVII of these regulations-Wellhead Protection Regulations; and

6. Proper placement, maintenance and testing of backflow prevention and cross connection devices, as described in Part XX of these regulations.

§ 206 MAXIMUM CONTAMINANT LEVELS FOR TURBIDITY

The MCL for turbidity are applicable to both community and non-community water systems using surface water sources in whole or in part. The MCL for turbidity in drinking water, measured at a representative entry point(s) to the distribution system are:

A. One turbidity unit (TU), as determined by a monthly average pursuant to § 414, except that five or fewer turbidity units may be allowed if the public water system owner or operator can demonstrate to the Director that the higher turbidity level does not:

1. Interfere with disinfection;

2. Prevent maintenance of an effective disinfectant agent throughout the distribution system; or

3. Interfere with microbiological determinations.

B. Five turbidity units based on an average for two consecutive days pursuant to § 414.

§ 207 MAXIMUM CONTAMINANT LEVELS and MAXIMUM CONTAMINANT LEVEL GOALS for DISINFECTION BYPRODUCTS

A. Applicability

1. The MCLs and MCLGs for Disinfection Byproducts are as follows:

TABLE 200.7 MCLs FOR DISINFECTION BYPRODUCTS

Disinfection Byproduct	MCL (mg/L)	MCLG (mg/L)
Total Trihalomethanes (TTHM)	0.080	
Haloacetic acids (five) (HAA5)	0.060	
Bromate	0.010	Zero
Chlorite	1.0	0.8
Bromodichloromethane		Zero
Bromoform		Zero
Dichloroacidic Acid		Zero
Trichloroacidic Acid		0.3
Dibromochloromethane		0.06

B. Compliance Dates

1. All CWSs and NTNCWSs:

   a. Part VIII - General Requirements for Surface Water Systems serving 10,000 or more persons must comply with this section upon promulgation of these regulations;

   b. Part VIII - General Requirements for Surface Water Systems serving fewer than 10,000 persons must comply with this section beginning January 1, 2004;

   c. Public water systems using only ground water not under the direct influence of surface water must comply with this section beginning January 1, 2004.

2. A system that is installing GAC or membrane technology to comply with this section may apply to the Director for an extension of up to 24 months past the date of promulgation of these regulations, but not beyond December 31, 2003. In granting the extension, the Director must set a schedule for compliance and may specify any interim measures that the system must take. Failure to meet the schedule or interim treatment requirements constitutes a violation of the NNPDWR.

C. The Administrator, pursuant to § 1412 of the SDWA, has identified the following as the best available technology, treatment techniques, or other means available to achieve compliance with the MCLs for disinfection byproducts identified in subsection (A) of this section:

TABLE 200.8 BATs FOR DISINFECTION BYPRODUCTS

Disinfection Byproduct	Best Available Technology
TTHM	Enhanced coagulation or enhanced softening or GAC10, with chlorine as the primary and residual disinfectant.
HAA5	Enhanced coagulation or enhanced softening or GAC10, with chlorine as the primary and residual disinfectant.
Bromate	Control of ozone treatment processes to reduce production of bromate.
Chlorite	Control of treatment processes to reduce disinfectant demand and control of disinfection treatment processes to reduce disinfectant levels.

§ 208 MAXIMUM RESIDUAL DISINFECTANT LEVELS and MAXIMUM RESIDUAL DISINFECTANT LEVEL GOALS

A. Applicability

1. The Maximum Residual Disinfectant Levels and Maximum Residual Disinfectant Level Goals are as follows:

TABLE 200.9 MAXIMUM RESIDUAL DISINFECTANT LEVELS (MRDLs) and MAXIMUM RESIDUAL DISINFECTANT LEVEL GOALS (MRDLGs)

Disinfectant residual	MRDL (mg/L)	MRDLG (mg/L)
Chlorine	4.0 (as Cl_2)	4.0 (as Cl_2)
Chloramines	4.0 (as Cl_2)	4.0 (as Cl_2)
Chlorine dioxide	0.8 (as ClO_2)	0.8 (as ClO_2)

B. Compliance Dates

1. All CWSs and NTNCWSs:

a. *Part VIII - General Requirements for Surface Water Systems serving 10,000 or more persons must comply with this section upon promulgation of these regulations;*

b. Part VIII - General Requirements for Surface Water Systems serving fewer than 10,000 persons must comply with this section beginning January 1, 2004;

c. Public water systems using only ground water, not under the direct influence of surface water, must comply with this section beginning January 1, 2004.

2. All TNCWSs:

a. Part VIII - General Requirements for Surface Water Systems serving 10,000 or more persons and using chlorine dioxide as a disinfectant or oxidant must comply with the chlorine dioxide MRDL upon promulgation of these regulations;

b. Part VIII - General Requirements for Surface Water Systems serving fewer than 10,000 persons and using chlorine dioxide as a disinfectant or oxidant must comply with the chlorine dioxide MRDL beginning January 1, 2004;

c. Public water systems using only ground water, not under the direct influence of surface water, and using chlorine dioxide as a disinfectant or oxidant must comply with the chlorine dioxide MRDL beginning January 1, 2004.

C. The Administrator, pursuant to §1412 of the SDWA, has identified the following as the best available technology, treatment techniques, or other means available to achieve compliance with the maximum residual disinfectant levels identified in subsection (A) of this section: control of treatment processes to reduce disinfectant demand and control of disinfection treatment processes to reduce disinfectant levels.

§ 209 MAXIMUM CONTAMINANT LEVELS AND MAXIMUM CONTAMINANT LEVEL GOALS FOR RADIONUCLIDES

A. Applicability

1. The following MCLs and MCLGs for radionuclides apply to CWSs.

Table 200.10 MAXIMUM CONTAMINANT LEVELS and MAXIMUM CONTAMINANT LEVEL GOALS FOR RADIONUCLIDES

#	Contaminant	MCL	MCLG
1	Gross alpha particle activity	15 pCi/L (including radium-226 but excluding radon and uranium)	Zero
2	Combined radium-226 and radium-228	5 pCi/L (see note 1 below)	Zero
3	Beta particle and photon radioactivity	4 millirem/year (see notes 2 and 3 below)	Zero
4	Uranium	30 micrograms per liter (ug/L)	Zero

Notes:

1. The combined radium-226 and radium-228 value is determined by adding the results of the analysis for radium-226 and the analysis for radium-228.
2. The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water must not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year (mrem/year).
3. Except for the radionuclides listed in Table 200.11, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents must be calculated on the basis of 2 liters per day drinking water intake using the 168 hour data list in "Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure, NBS (National Bureau of Standards) Handbook 69 as amended August 1963, U.S. Department of Commerce'. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 mrem/year.

' This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of this document are available from the National Technical Information Service, NTIS ADA 280 282, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161. The toll-free number is 800-553-6847. Copies may be inspected at EPA's Drinking Water Docket, 401 M Street, SW., Washington, DC 20460; or at the Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC.

TABLE 200.11 AVERAGE ANNUAL CONCENTRATIONS ASSUMED TO PRODUCE A TOTAL BODY OR ORGAN DOSE OF 4 mrem/yr

#	Radionuclide	Critical organ	pCi per liter
1	Tritium	Total body	20,000
2	Strontium-90	Bone marrow	8

B. Compliance dates for combined radium-226 and radium-228, gross alpha particle activity, gross beta particle, photon radioactivity, and uranium:

1. CWSs must comply with the MCLs listed in Table 200.10 beginning December 8, 2003 and compliance shall be determined in accordance with the requirements of § 411. Compliance with the reporting requirements for radionuclides is listed in Part XII (Consumer Confidence Report) Appendix F and Part VII (Public Notification) Appendices B and is required beginning December 8, 2003.

C. BATs for radionuclides

1. The Administrator pursuant to § 1412 of the SDWA has identified as indicated in the following table, the best available technology to achieve compliance with the MCLs for combined radium-226 and radium-228, uranium, gross alpha particle activity, beta particle and photon radioactivity.

TABLE 200.12 BATs FOR COMBINED RADIUM-226 AND RADIUM-228, URANIUM, GROSS ALPHA PARTICLE ACTIVITY, BETA PARTICLE AND PHOTON RADIOACTIVITY

#	Contaminant	BATs
1	Combined radium-226 and radium-228	Ion exchange, reverse osmosis, lime softening
2	*Uranium*	Ion exchange, reverse osmosis, lime softening, coagulation/filtration
3	Gross alpha particle activity (excluding radon and uranium)	Reverse osmosis
4	Beta particle and photon radioactivity	Ion exchange, reverse osmosis

D. Compliance technologies for radionuclides for *small water systems*

TABLE 200.13 COMPLIANCE TECHNOLOGIES FOR RADIONUCLIDES FOR SMALL WATER SYSTEMS AND LIMITATIONS OF USE

#	Unit Technologies	Limitations (see footnotes)	Operator skill level[1]	Raw water quality range and considerations[2]
1.	Ion exchange (IE)	a	Intermediate	All ground waters
2.	Point of use (POU [2])	b	Basic	All ground waters
3.	Reverse osmosis (RO)	c	Advanced	Surface waters usually require pre-filtration
4.	POU[2] RO	b	Basic	Surface waters usually require pre-filtration
5.	Lime softening	d	Advanced	All waters
6.	Green sand filtration	e	Basic	
7.	Co-precipitation with barium sulfate	f	Intermediate to Advanced	Ground waters with suitable water quality
8.	Electrodialysis/ electrodialysis reversal		Basic to Intermediate	All ground waters
9.	Pre-formed hydrous manganese oxide filtration	g	Intermediate	All ground waters
10.	Activated alumina	a, h	Advanced	All ground waters; competing anion concentrations may affect regeneration frequency
11.	Enhanced coagulation/ filtration	i	Advanced	Can treat a wide range of water qualities

[1] National Research Council (NRC). Safe Water from Every Tap: Improving Water Service to Small Communities. National Academy Press. Washington, D.C. 1997. Basic means Level 1, Intermediate means Level 2 or 3 and Advanced means Level 4 as defined in §1400.

[2] A POU, or ``point-of-use'' technology is a treatment device installed at a single tap used for the purpose of reducing contaminants in drinking water at that one tap. POU devices are typically installed at the kitchen tap. See the April 21, 2000 NODA for more details.

Limitations Footnotes: Technologies for Radionuclides:

a The regeneration solution contains high concentrations of the contaminant ions. Disposal options should be carefully considered before choosing this technology.

b When POU devices are used for compliance, programs for long-term operation, maintenance, and monitoring must be provided by water utility to ensure proper performance.

c Reject water disposal options should be carefully considered before choosing this technology. See other RO limitations described in the SWTR Compliance Technologies Table.

d The combination of variable source water quality and the complexity of the water chemistry involved may make this technology too complex for small surface water systems.

e *Removal efficiencies can vary depending on water quality.*
f This technology may be very limited in application to small systems. Since the process requires static mixing, detention basins, and filtration, it is most applicable to systems with sufficiently high sulfate levels that already have a suitable filtration treatment train in place.
g This technology is most applicable to small systems that already have filtration in place.
h Handling of chemicals required during regeneration and pH adjustment may be too difficult for small systems without an adequately trained operator.
i Assumes modification to a coagulation/filtration process already in place.

Table 200.14 COMPLIANCE TECHNOLOGIES BY SYSTEM SIZE CATEGORY FOR RADIONUCLIDES

#	Contaminant	Compliance Technologies[1] for systems size categories (population served)		
		25-500	501-3,300	3,300-10,000
1	Combined radium-226 and radium-228	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7. 8, 9
2	Gross alpha particle activity	3, 4	3, 4	3, 4
3	Beta particle activity and photon activity	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4
4	Uranium	1, 2, 4, 10, 11	1, 2, 3, 4, 5,10,11	1, 2, 3, 4, 5, 10, 11

NOTE: [1]Numbers correspond to those technologies found listed in the Table 200.13 of this section.

§ 210 MAXIMUM CONTAMINANT LEVELS FOR TOTAL TRIHALOMETHANES

1. The MCL of 0.010 mg/L for total trihalomethanes (the sum of the concentration of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform) and trichloromethane (chloroform)) applies to Part VIII-General Requirements for Surface Water Systems which serve a population of 10,000 people or more until December 31, 2001. This MCL applies to CWS's that use only ground water not under the direct influence of surface water and serve a population of 10,000 people or more until December 31, 2003. Compliance with the MCL for TTHM's is calculated pursuant to § 413. After December 31, 2003, this section is no longer applicable.

REFERENCE 23

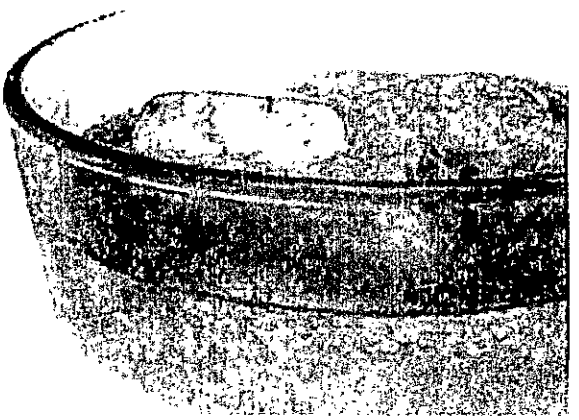
U.S. Environmental Protection Agency

Ground Water & Drinking Water

Drinking Water and Health Basics
Frequently Asked Questions
Local Drinking Water Information
Drinking Water Standards
List of Contaminants & MCLs
Regulations & Guidance
Public Drinking Water Systems
Source Water Protection
Underground Injection Control
Data & Databases
Drinking Water Academy
Safe Drinking Water Act
National Drinking Water Advisory Council
Water Infrastructure Security

List of Drinking Water Contaminants & MCLs

National Primary Drinking Water Regulations



National Primary Drinking Water Regulations (NPDWRs or primary standards) are legally enforceable *standards that apply to public water* systems. Primary standards protect public health by limiting the levels of contaminants in drinking water. Visit the list of regulated contaminants with links for more details.

- List of Contaminants & their Maximum Contaminant Level (MCLs)
- Setting Standards for Safe Drinking Water to learn about EPA's standard-setting process
- EPA's Regulated Contaminant Timeline (86 K PDF FILE, 1 pg) (ALL ABOUT PDF FILES)
- National Primary Drinking Water Regulations EXIT disclaimer - The complete regulations regarding these contaminants availible from the Code of Federal Regulations Website

National Secondary Drinking Water Regulations

National Secondary Drinking Water Regulations (NSDWRs or secondary standards) are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.

- List of National Secondary Drinking Water Regulations
- National Secondary Drinking Water Regulations EXIT disclaimer - The complete regulations regarding these contaminants availible from the Code of Federal Regulations Web Site.

Unregulated Contaminants

This list of contaminants which, at the time of publication, are not subject to any proposed or promulgated national primary drinking water regulation (NPDWR), are known or anticipated to occur in public water systems, and may require regulations under SDWA. For more information check out the list, or vist the Drinking Water Contaminant Candidate List (CCL) web site.

- List of Unregulated Contaminants
- Drinking Water Contaminant Candidate List (CCL) Web Site
- Unregulated Contaminant Monitoring Program (UCM)

List of Contaminants & their MCLs

EPA 816-F-02-013
July 2002

Microorganisms | Disinfectants | Disinfection Byproducts | Inorganic Chemicals | Organic Chemicals | Radionuclides

- The links provided below are to either Consumer Fact Sheet, Rule Implementation web sites, or PDF files (ALL ABOUT PDF FILES)
- Alphabetical Version of this chart in PDF format EPA 816-F-03-016 June 2003 (396 K PDF FILE) (ALL ABOUT PDF FILES)

Microorganisms

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Cryptosporidium (pdf file)	zero	TT[3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and fecal animal waste
Giardia lamblia	zero	TT[3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste
Heterotrophic plate count	n/a	TT[3]	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that are naturally present in the environment
Legionella	zero	TT[3]	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems
Total Coliforms (including fecal coliform and *E. Coli*)	zero	5.0%[4]	Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present[5]	Coliforms are naturally present in the environment; as well as feces; fecal coliforms and *E. coli* only come from human and animal fecal waste.
Turbidity	n/a	TT[3]	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff

Viruses (enteric)	zero	TT[3]	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste

Disinfection Byproducts

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Bromate	zero	0.010	Increased risk of cancer	Byproduct of drinking water disinfection
Chlorite	0.8	1.0	Anemia; infants & young children: nervous system effects	Byproduct of drinking water disinfection
Haloacetic acids (HAA5)	n/a[6]	0.060	Increased risk of cancer	Byproduct of drinking water disinfection
Total Trihalomethanes (TTHMs)	none[7] ---------- n/a[6]	0.10 --------- - 0.080	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection

Disinfectants

Contaminant	MRDLG[1] (mg/L)[2]	MRDL[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Chloramines (as Cl_2)	MRDLG=4[1]	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort, anemia	Water additive used to control microbes
Chlorine (as Cl_2)	MRDLG=4[1]	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort	Water additive used to control microbes
Chlorine dioxide (as ClO_2)	MRDLG=0.8[1]	MRDL=0.8[1]	Anemia; infants & young children: nervous system effects	Water additive used to control microbes

Inorganic Chemicals

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Antimony	0.006	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder
Arsenic	0[7]	0.010 as of 01/23/06	Skin damage or problems with circulatory systems, and may have increased	Erosion of natural deposits; runoff from orchards, runoff from

			risk of getting cancer	glass & electronicsproduction wastes
Asbestos (fiber >10 micrometers)	7 million fibers per liter	7 MFL	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits
Barium	2	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Beryllium	0.004	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries
Cadmium	0.005	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints
Chromium (total)	0.1	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits
Copper	1.3	TT[8]; Action Level=1.3	Short term exposure: Gastrointestinal distress Long term exposure: Liver or kidney damage People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits
Cyanide (as free cyanide)	0.2	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories
Fluoride	4.0	4.0	Bone disease (pain and tenderness of the bones); Children may get mottled teeth	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories
Lead	zero	TT[8]; Action Level=0.015	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span	Corrosion of household plumbing systems; erosion of natural deposits

			and learning abilities Adults: Kidney problems; high blood pressure	
Mercury (inorganic)	0.002	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands
Nitrate (measured as Nitrogen)	10	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. *Symptoms include* shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Nitrite (measured as Nitrogen)	1	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Selenium	0.05	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum refineries; erosion of natural deposits; discharge from mines
Thallium	0.0005	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories

Organic Chemicals

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Acrylamide	zero	TT[9]	Nervous system or blood problems; increased risk of cancer	Added to water during sewage/wastewater treatment
Alachlor	zero	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of	Runoff from herbicide used on row crops

			cancer	
Atrazine	0.003	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops
Benzene	zero	0.005	Anemia; decrease in blood platelets; increased risk of *cancer*	Discharge from factories; leaching from gas storage tanks and landfills
Benzo(a)pyrene (PAHs)	zero	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines
Carbofuran	0.04	0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa
Carbon tetrachloride	zero	0.005	Liver problems; increased risk of *cancer*	Discharge from chemical plants *and other industrial* activities
Chlordane	zero	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide
Chlorobenzene	0.1	0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories
2,4-D	0.07	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops
Dalapon	0.2	0.2	Minor kidney changes	Runoff from herbicide used on rights of way
1,2-Dibromo-3-chloropropane (DBCP)	zero	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards
o-Dichlorobenzene	0.6	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories
p-Dichlorobenzene	0.075	0.075	Anemia; liver, kidney or spleen damage; changes in blood	Discharge from industrial chemical factories
1,2-Dichloroethane	zero	0.005	Increased risk of	Discharge from

			cancer	industrial chemical factories
1,1-Dichloroethylene	0.007	0.007	Liver problems	Discharge from industrial chemical factories
cis-1,2-Dichloroethylene	0.07	0.07	Liver problems	Discharge from industrial chemical factories
trans-1,2-Dichloroethylene	0.1	0.1	Liver problems	Discharge from industrial chemical factories
Dichloromethane	zero	0.005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories
1,2-Dichloropropane	zero	0.005	Increased risk of cancer	Discharge from industrial chemical factories
Di(2-ethylhexyl) adipate	0.4	0.4	Weight loss, liver problems, or possible reproductive difficulties.	Discharge from chemical factories
Di(2-ethylhexyl) phthalate	zero	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories
Dinoseb	0.007	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables
Dioxin (2,3,7,8-TCDD)	zero	0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories
Diquat	0.02	0.02	Cataracts	Runoff from herbicide use
Endothall	0.1	0.1	Stomach and intestinal problems	Runoff from herbicide use
Endrin	0.002	0.002	Liver problems	Residue of banned insecticide
Epichlorohydrin	zero	TT[9]	Increased cancer risk, and over a long period of time, stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals

Ethylbenzene	0.7	0.7	Liver or kidneys problems	Discharge from petroleum refineries
Ethylene dibromide	zero	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries
Glyphosate	0.7	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use
Heptachlor	zero	0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide
Heptachlor epoxide	zero	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor
Hexachlorobenzene	zero	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories
Hexachlorocyclopentadiene	0.05	0.05	Kidney or stomach problems	Discharge from chemical factories
Lindane	0.0002	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens
Methoxychlor	0.04	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock
Oxamyl (Vydate)	0.2	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes
Polychlorinated biphenyls (PCBs)	zero	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer	Runoff from landfills; discharge of waste chemicals

Pentachlorophenol	zero	0.001	Liver or kidney problems; increased cancer risk	Discharge from wood preserving factories
Picloram	0.5	0.5	Liver problems	Herbicide runoff
Simazine	0.004	0.004	Problems with blood	Herbicide runoff
Styrene	0.1	0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills
Tetrachloroethylene	zero	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners
Toluene	1	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories
Toxaphene	zero	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle
2,4,5-TP (Silvex)	0.05	0.05	Liver problems	Residue of banned herbicide
1,2,4-Trichlorobenzene	0.07	0.07	Changes in adrenal glands	Discharge from textile finishing factories
1,1,1-Trichloroethane	0.20	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories
1,1,2-Trichloroethane	0.003	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories
Trichloroethylene	zero	0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories
Vinyl chloride	zero	0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories
Xylenes (total)	10	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories

Radionuclides

Contaminant	MCLG[1] (mg/L)[2]	MCL or TT[1] (mg/L)[2]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Alpha particles	none[7] ---------- zero	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation
Beta particles and photon emitters	none[7] ---------- zero	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation
Radium 226 and Radium 228 (combined)	none[7] ---------- zero	5 pCi/L	Increased risk of cancer	Erosion of natural deposits
Uranium	zero	30 ug/L as of 12/08/03	Increased risk of cancer, kidney toxicity	Erosion of natural deposits

Notes

[1] Definitions:
Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
Maximum Contaminant Level Goal (MCLG) - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
Maximum Residual Disinfectant Level (MRDL) - The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
Maximum Residual Disinfectant Level Goal (MRDLG) - The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
Treatment Technique - A required process intended to reduce the level of a contaminant in drinking water.

[2] Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million.

[3] EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- *Cryptosporidium:* (as of1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99% removal.
- *Giardia lamblia:* 99.9% removal/inactivation
- Viruses: 99.99% removal/inactivation
- *Legionella:* No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.
- Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelolometric turbidity

units (NTU); systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month. As of January 1, 2002, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily samples in any month.
- HPC: No more than 500 bacterial colonies per milliliter.
- Long Term 1 Enhanced Surface Water Treatment (Effective Date: January 14, 2005); Surface water systems or (GWUDI) systems serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems).
- Filter Backwash Recycling; The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

[4] more than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli* if two consecutive TC-positive samples, and one is also positive for *E.coli* fecal coliforms, system has an acute MCL violation.

[5] Fecal coliform and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.

[6] Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L). Chloroform is regulated with this group but has no MCLG.
- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L). Monochloroacetic acid, bromoacetic acid, and dibromoacetic acid are regulated with this group but have no MCLGs.

[7] MCLGs were not established before the 1986 Amendments to the Safe Drinking Water Act. Therefore, there is no MCLG for this contaminant.

[8] Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

[9] Each water system must certify, in writing, to the state (using third-party or manufacturer's certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows:

- Acrylamide = 0.05% dosed at 1 mg/L (or equivalent)
- Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent)

National Secondary Drinking Water Regulations

National Secondary Drinking Water Regulations (NSDWRs or secondary standards) are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.

- For more information, read Secondary Drinking Water Regulations: Guidance for Nuisance Chemicals.

Contaminant	Secondary Standard
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

REFERENCE 24

Ref

20.6.2 NMAC

NEW MEXICO
WATER QUALITY CONTROL COMMISSION
REGULATIONS

Effective September 15, 2002

New Mexico Water Quality Control Commission
1190 St. Francis Drive, P.O. Box 26110
Santa Fe, New Mexico 87502

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TITLE 20 ENVIRONMENTAL PROTECTION
CHAPTER 6 WATER QUALITY
PART 2 GROUND AND SURFACE WATER PROTECTION

EE. **"non-aqueous phase liquid"** means an interstitial body of liquid oil, petroleum product, petrochemical, or organic solvent, including an emulsion containing such material;

FF. **"operational area"** means a geographic area defined in a project discharge permit where a group of wells or well fields in close proximity comprise a single Class III well operation;

GG. **"owner of record"** means an owner of property according to the property records of the tax assessor in the county in which the discharge site is located.

HH. **"packer"** means a device lowered into a well to produce a fluid-tight seal within the casing;

II. **"person"** means an individual or any other entity including partnerships, corporation, associations, responsible business or association agents or officers, the state or a political subdivision of the state or any agency, department or instrumentality of the United States and any of its officers, agents or employees;

JJ. **"petitioner"** means a person seeking a variance from a regulation of the commission pursuant to Section 74-6-4(G) NMSA 1978;

KK. **"plugging"** means the act or process of stopping the flow of water, oil or gas into or out of a geological formation, group of formations or part of a formation through a borehole or well penetrating these geologic units;

LL. **"project discharge permit"** means a discharge permit which describes the operation of similar Class III wells or well fields within one or more individual operational areas;

MM. **"refuse"** includes food, swill, carrion, slops and all substances from the preparation, cooking and consumption of food and from the handling, storage and sale of food products, the carcasses of animals, junked parts of automobiles and other machinery, paper, paper cartons, tree branches, yard trimmings, discarded furniture, cans, oil, ashes, bottles, and all unwholesome material;

NN. **"responsible person"** means a person who is required to submit an abatement plan or who submits an abatement plan pursuant to this Part;

OO. **"secretary"** or **"director"** means the secretary of the New Mexico Department of Environment or the director of a constituent agency designated by the commission;

PP. **"sewer system"** means pipelines, conduits, pumping stations, force mains, or other structures, devices, appurtenances or facilities used for collecting or conducting wastes to an ultimate point for treatment or disposal;

QQ. **"sewerage system"** means a system for disposing of wastes, either by surface or underground methods, and includes sewer systems, treatment works, disposal wells and other systems;

RR. **"significant modification of Stage 2 of the abatement plan"** means a change in the abatement technology used excluding design and operational parameters, or re-location of 25 percent or more of the compliance sampling stations, for any single medium, as designated pursuant to Paragraph (4) of Subsection E of 20.6.2.4106 NMAC;

SS. **"subsurface fluid distribution system"** means an assemblage of perforated pipes, drain tiles, or other mechanisms intended to distribute fluids below the surface of the ground;

TT. **"subsurface water"** means ground water and water in the vadose zone that may become ground water or surface water in the reasonably foreseeable future or may be utilized by vegetation;

UU. **"TDS"** means total dissolved solids as determined by the "calculation method" (sum of constituents), by the "residue on evaporation method at 180 degrees" of the "U.S. Geological Survey Techniques of Water Resource Investigations," or by conductivity, as the secretary may determine;

VV. **"toxic pollutant"** means a water contaminant or combination of water contaminants in concentration(s) which, upon exposure, ingestion, or assimilation either directly from the environment or indirectly by ingestion through food chains, will unreasonably threaten to injure human health, or the health of animals or plants which are commonly hatched, bred, cultivated or protected for use by man for food or economic benefit. As used in this definition injuries to health include death, histopathologic change, clinical symptoms of disease, behavioral abnormalities, genetic mutation, physiological malfunctions or physical deformations in such organisms or their offspring. In order to be considered a toxic pollutant a contaminant must be one or a combination of the potential toxic pollutants listed below and be at a concentration shown by scientific information currently available to the public to have potential for causing one or more of the effects listed above. Any water contaminant or combination of the water contaminants in the list below creating a lifetime risk of more than one cancer per 100,000 exposed persons is a toxic pollutant.

acrolein
acrylonitrile
aldrin
benzene

benzidine
carbon tetrachloride
chlordane
chlorinated benzenes
    monochlorobenzene
    hexachlorobenzene
    pentachlorobenzene
1,2,4,5-tetrachlorobenzene
chlorinated ethanes
    1,2-dichloroethane
    hexachloroethane
    1,1,2,2-tetrachloroethane
    1,1,1-trichloroethane
    1,1,2-trichloroethane
chlorinated phenols
    2,4-dichlorophenol
    2,4,5-trichlorophenol
    2,4,6-trichlorophenol
chloroalkyl ethers
    bis (2-chloroethyl) ether
    bis (2-chloroisopropyl) ether
    bis (chloromethyl) ether
chloroform
DDT
dichlorobenzene
dichlorobenzidine
1,1-dichloroethylene
dichloropropenes
dieldrin
2,4-dinitrotoluene
diphenylhydrazine
endosulfan
endrin
ethylbenzene
halomethanes
    bromodichloromethane
    bromomethane
    chloromethane
    dichlorodifluoromethane
    dichloromethane
    tribromomethane
    trichlorofluoromethane
heptachlor
hexachlorobutadiene
hexachlorocyclohexane (HCH)
    alpha-HCH
    beta-HCH
    gamma-HCH
    technical HCH
hexachlorocyclopentadiene
isophorone
nitrobenzene
nitrophenols
    2,4-dinitro-o-cresol
    dinitrophenols
nitrosamines

N-nitrosodiethylamine
N-nitrosodimethylamine
N-nitrosodibutylamine
N-nitrosodiphenylamine
N-nitrosopyrrolidine
pentachlorophenol
phenol
phthalate esters
dibutyl phthalate
di-2-ethylhexyl phthalate
diethyl phthalate
dimethyl phthalate
polychlorinated biphenyls (PCB's)
polynuclear aromatic hydrocarbons (PAH)
anthracene
3,4-benzofluoranthene
benzo (k) fluoranthene
fluoranthene
fluorene
phenanthrene
pyrene
tetrachloroethylene
toluene
toxaphene
trichloroethylene
vinyl chloride
xylenes
o-xylene
m-xylene
p-xylene
1,1-dichloroethane
ethylene dibromide (EDB)
cis-1,2-dichloroethylene
trans-1,2-dichloroethylene
naphthalene
1-methylnaphthalene
2-methylnaphthalene
benzo-a-pyrene

WW. **"vadose zone"** means earth material below the land surface and above ground water, or in between bodies of ground water;

XX. **"wastes"** means sewage, industrial wastes, or any other liquid, gaseous or solid substance which will pollute any waters of the state;

YY. **"water"** means all water including water situated wholly or partly within or bordering upon the state, whether surface or subsurface, public or private, except private waters that do not combine with other surface or subsurface water;

ZZ. **"water contaminant"** means any substance that could alter if discharged or spilled the physical, chemical, biological or radiological qualities of water. "Water contaminant" does not mean source, special nuclear or by-product material as defined by the Atomic Energy Act of 1954;

AAA. **"watercourse"** means any river, creek, arroyo, canyon, draw, or wash, or any other channel having definite banks and beds with visible evidence of the occasional flow of water;

BBB. **"water pollution"** means introducing or permitting the introduction into water, either directly or indirectly, of one or more water contaminants in such quantity and of such duration as may with reasonable probability injure human health, animal or plant life or property, or to unreasonably interfere with the public welfare or the use of property;

CCC. **"well"** means: (1) A bored, drilled, or driven shaft; (2) A dug hole whose depth is greater than the largest surface dimension; (3) An improved sinkhole; or (4) A subsurface fluid distribution system;

standard specified in Subsection A, B, or C of this section, the existing pH or concentration shall be the allowable limit, provided that the discharge at such concentrations will not result in concentrations at any place of withdrawal for present or reasonably foreseeable future use in excess of the standards of this section. These standards shall apply to the dissolved portion of the contaminants specified with a definition of dissolved being that given in the publication "Methods for Chemical Analysis of Water and Waste of the U.S. Environmental Protection Agency," with the exception that standards for mercury, organic compounds and non-aqueous phase liquids shall apply to the total unfiltered concentrations of the contaminants.

A. **Human Health Standards**-Ground water shall meet the standards of Subsection A and B of this section unless otherwise provided. If more than one water contaminant affecting human health is present, the toxic pollutant criteria as set forth in the definition of toxic pollutant in Section 20.6.2.1101 NMAC for the combination of contaminants, or the Human Health Standard of Subsection A of Section 20.6.2.3103 NMAC for each contaminant shall apply, whichever is more stringent. Non-aqueous phase liquid shall not be present floating atop of or immersed within ground water, as can be reasonably measured.

(1) Arsenic (As).....0.1 mg/l
(2) Barium (Ba).....1.0 mg/l
(3) Cadmium (Cd).....0.01 mg/l
(4) Chromium (Cr).....0.05 mg/l
(5) Cyanide (CN).....0.2 mg/l
(6) Fluoride (F).....1.6 mg/l
(7) Lead (Pb).....0.05 mg/l
(8) Total Mercury (Hg).....0.002 mg/l
(9) Nitrate (NO_3 as N).....10.0 mg/l
(10) Selenium (Se).....0.05 mg/l
(11) Silver (Ag).....0.05 mg/l
(12) Uranium (U).....5.0 mg/l
(13) Radioactivity: Combined Radium-226 & Radium-228.....30 pCi/l
(14) Benzene.....0.01 mg/l
(15) Polychlorinated biphenyls (PCB's).....0.001 mg/l
(16) Toluene.....0.75 mg/l
(17) Carbon Tetrachloride.....0.01 mg/l
(18) 1,2-dichloroethane (EDC).....0.01 mg/l
(19) 1,1-dichloroethylene (1,1-DCE).....0.005 mg/l
(20) 1,1,2,2-tetrachloroethylene (PCE).....0.02 mg/l
(21) 1,1,2-trichloroethylene (TCE).....0.1 mg/l
(22) ethylbenzene.....0.75 mg/l
(23) total xylenes.....0.62 mg/l
(24) methylene chloride.....0.1 mg/l
(25) chloroform.....0.1 mg/l
(26) 1,1-dichloroethane.....0.025 mg/l
(27) ethylene dibromide (EDB).....0.0001 mg/l
(28) 1,1,1-trichloroethane.....0.06 mg/l
(29) 1,1,2-trichloroethane.....0.01 mg/l
(30) 1,1,2,2-tetrachloroethane.....0.01 mg/l
(31) vinyl chloride.....0.001 mg/l
(32) PAHs: total naphthalene plus monomethylnaphthalenes.....0.03 mg/l
(33) benzo-a-pyrene.....0.0007 mg/l

B. **Other Standards for Domestic Water Supply**

(1) Chloride (Cl).....250.0 mg/l
(2) Copper (Cu).....1.0 mg/l
(3) Iron (Fe).....1.0 mg/l
(4) Manganese (Mn).....0.2 mg/l
(6) Phenols.....0.005 mg/l
(7) Sulfate (SO_4).....600.0 mg/l
(8) Total Dissolved Solids (TDS).....1000.0 mg/l
(9) Zinc (Zn).....10.0 mg/l
(10) pH.....between 6 and 9

C. Standards for Irrigation Use - Ground water shall meet the standards of Subsection A, B, and C of this section unless otherwise provided.

(1) Aluminum (Al)..... .....5.0 mg/l
(2) Boron (B) .....0.75 mg/l
(3) Cobalt (Co) .....0.05 mg/l
(4) Molybdenum (Mo) .....1.0 mg/l
(5) Nickel (Ni) .....0.2 mg/l

[2-18-77, 1-29-82, 11-17-83, 3-3-86, 12-1-95; 20.6.2.3103 NMAC – Rn, 20 NMAC 6.2.III.3103, 1-15-01]

20.6.2.3104 DISCHARGE PERMIT REQUIRED: Unless otherwise provided by this Part, no person shall cause or allow effluent or leachate to discharge so that it may move directly of indirectly into ground water unless he is discharging pursuant to a discharge permit issued by the secretary. When a permit has been issued, discharges must be consistent with the terms and conditions of the permit. In the event of a transfer of the ownership, control, or possession of a facility for which a discharge permit is in effect, the transferee shall have authority to discharge under such permit, provided that the transferee has complied with Section 20.6.2.3111 NMAC, regarding transfers. [2-18-77, 12-24-87, 12-1-95; Rn & A, 20.6.2.3104 NMAC – 20 NMAC 6.2.III.3104, 1-15-01; A, 12-1-01]

20.6.2.3105 EXEMPTIONS FROM DISCHARGE PERMIT REQUIREMENT: Sections 20.6.2.3104 and 20.6.2.3106 NMAC do not apply to the following:

A. Effluent or leachate which conforms to all the listed numerical standards of Section 20.6.2.3103 NMAC and has a total nitrogen concentration of 10 mg/l or less, and does not contain any toxic pollutant. To determine conformance, samples may be taken by the agency before the effluent or leachate is discharged so that it may move directly or indirectly into ground water; provided that if the discharge is by seepage through non-natural or altered natural materials, the agency may take samples of the solution before or after seepage. If for any reason the agency does not have access to obtain the appropriate samples, this exemption shall not apply;

B. Effluent which is discharged from a sewerage system used only for disposal of household and other domestic waste which is designed to receive and which receives 2,000 gallons or less of liquid waste per day;

C. Water used for irrigated agriculture, for watering of lawns, trees, gardens or shrubs, or for irrigation for a period not to exceed five years for the revegetation of any disturbed land area, unless that water is received directly from any sewerage system;

D. Discharges resulting from the transport or storage of water diverted, provided that the water diverted has not had added to it after the point of diversion any effluent received from a sewerage system, that the source of the water diverted was not mine workings, and that the secretary has not determined that a hazard to public health may result;

E. Effluent which is discharged to a watercourse which is naturally perennial; discharges to dry arroyos and ephemeral streams are not exempt from the discharge permit requirement, except as otherwise provided in this section;

F. Those constituents which are subject to effective and enforceable effluent limitations in a National Pollutant Discharge Elimination System (NPDES) permit, where discharge onto or below the surface of the ground so that water contaminants may move directly or indirectly into ground water occurs downstream from the outfall where NPDES effluent limitations are imposed, unless the secretary determines that a hazard to public health may result. For purposes of this subsection, monitoring requirements alone do not constitute effluent limitations;

G. Discharges resulting from flood control systems;

H. Leachate which results from the direct natural infiltration of precipitation through disturbed materials, unless the secretary determines that a hazard to public health may result;

I. Leachate which results entirely from the direct natural infiltration of precipitation through undisturbed materials;

J. Leachate from materials disposed of in accordance with the Solid Waste Management Regulations (20 NMAC 9.1) adopted by the New Mexico Environmental Improvement Board;

K. Natural ground water seeping or flowing into conventional mine workings which re-enters the ground by natural gravity flow prior to pumping or transporting out of the mine and without being used in any mining process; this exemption does not apply to solution mining;

L. Effluent or leachate discharges resulting from activities regulated by a mining plan approved and permit issued by the New Mexico Coal Surface Mining Commission, provided that this exemption shall not be construed as limiting the application of appropriate ground water protection requirements by the New Mexico Coal Surface Mining Commission;

REFERENCE 25

Ref. 25

RECORD OF TELEPHONE CONVERSATION

SUPERFUND OVERSIGHT SECTION
GROUND WATER QUALITY BUREAU
NEW MEXICO ENVIRONMENT DEPARTMENT

Time: 3:30 p.m.	**Date: October 31, 2005**
Originating Party: Robin Brown, NMED Superfund Oversight Section (505) 827-2434	**Other Party: Yolanda Barney, Navajo Nation Public Water Systems Supervision Program (PWSSP) within the Navajo Nation Environmental Protection** Agency (928-871-7715)
Subject: Concentration Units for data that Agency e-mailed to me in August 2005	
Ms. Yolanda Barney stated that, except for radiochemistry, analyte concentrations from ground water samples are recorded in milligrams/liter (mg/L). Radiochemical samples are recorded in picocuries per liter(pCi/L).	

Signed_____

REFERENCE 26

Wells in the New Mexico Office of the State Engineers (OSE) data base that are within 4-mile radius of the Silver Spur Mine and Other State-Jurisdiction Mines w/in 2 miles of the Silver Spur Mine
The OSE WATERS data base was updated in 2003

OBJECTID	ID	X_COORD	Y_COORD	DB_FILE_N	USE	DIVERSI	POD_REC_	WELL_NUM	TWS
26137	620	238435	3924037	B 00362	MIN	0.00	620	B 00362	14N
26138	29	238835	3924237	B 00363	MIN	0.00	29	B 00363	14N
26145	354	238452	3924864	B 00373	MIN	0.00	354	B 00373	14N
26465	91	225721	3916385	B 00768	DOM	3.00	91	B 00768	13N
26520	968	225932	3916770	B 00847	STK	3.00	968	B 00847	13N
26553	435	225709	3916187	B 00883	DOM	3.00	435	B 00883	13N
26561	45	223896	3920841	B 00894 X	DOM	0.00	45	B 00894	14N
26561	45	223896	3920841	B 00894	DOM	3.00	45	B 00894	14N
26562	951	223797	3920942	B 00894	DOM	3.00	951	B 00894 X	14N
26570	787	223572	3921573	B 00902	DOM	3.00	787	B 00902	14N
26580	1033	224315	3921027	B 00920	DOM	3.00	1033	B 00920	14N
26598	1022	224315	3920827	B 00951	DOM	3.00	1022	B 00951	14N
26613	965	226186	3915485	B 00962	STK	0.00	965	B 00962	13N
26614	896	224615	3916329	B 00963	STK	0.00	896	B 00963	13N
26615	25	225412	3916302	B 00964	STK	0.00	25	B 00964	13N
26621	759	224749	3917205	B 00970	DOM	3.00	759	B 00970	13N
26634	1225	238452	3924864	B 00994	MIN	9962.00	1225	B 00994 S	14N
26680	606	226406	3919152	B 01052	STK	3.00	606	B 01052	13N
26681	408	225017	3916731	B 01053	DOM	3.00	408	B 01053	13N
26690	179950	224749	3917205	B 01065	DOM	3.00	179950	B 01065	13N
26713	715	225412	3916302	B 01091	DOM	3.00	715	B 01091	13N
26714	247	224339	3916821	B 01091	DOM	3.00	247	B 01091 X	13N
26778	640	224749	3917205	B 01160	DOM	3.00	640	B 01160	13N
26779	181663	224749	3917205	B 01161	MON	0.00	181663	B 01161	13N
26780	805	224749	3917205	B 01161	MON	0.00	805	B 01161 -0	13N
26781	600	224749	3917205	B 01161	MON	0.00	600	B 01161 -0	13N
26782	953	224749	3917205	B 01161	MON	0.00	953	B 01161 -0	13N
26783	201	224749	3917205	B 01161	MON	0.00	201	B 01161 -0	13N
26784	362	224749	3917205	B 01161	MON	0.00	362	B 01161 -0	13N
26785	1258	225721	3916385	B 01161	MON	0.00	1258	B 01161 0-	13N
26786	181672	224749	3917205	B 01161	MON	0.00	181672	B 01161 M	13N
26787	181213	224749	3917205	B 01161	MON	0.00	181213	B 01161 O	13N
26788	181676	224749	3917205	B 01161	MON	0.00	181676	B 01161 O	13N
26789	181677	224749	3917205	B 01161	MON	0.00	181677	B 01161 O	13N
26790	181678	224749	3917205	B 01161	MON	0.00	181678	B 01161 O	13N
26791	181679	224749	3917205	B 01161	MON	0.00	181679	B 01161 O	13N
26792	181680	224749	3917205	B 01161	MON	0.00	181680	B 01161 O	13N
26793	181681	224749	3917205	B 01161	MON	0.00	181681	B 01161 O	13N
26876	1352	225622	3916486	B 01241	DOM	3.00	1352	B 01241	13N
26890	341	225347	3917392	B 01254	SAN	3.00	341	B 01254	13N
26906	151	224749	3917205	B 01270	DOM	3.00	151	B 01270	13N
26919	1492	224970	3924017	B 01283	DOM	3.00	1492	B 01283	14N
26957	175	225017	3916731	B 01317	POL	36.00	175	B 01317	13N
26964	1154	224774	3924031	B 01326	MUL	3.00	1154	B 01326	14N
27123	177334	225170	3924017	B 01490	DOM	3.00	177334	B 01490	14N
27124	177333	224757	3923422	B 01491	STK	3.00	177333	B 01491	14N
27127	177330	224970	3924017	B 01494	DOM	3.00	177330	B 01494	14N
27159	284	224749	3917205	B 01605	DOM	3.00	284	B 01605	13N

DB_FILE_N	RNG	SEC	Q	Q2	Q3	ZC	X	Y	EASTING	NORTHING	START DAT	FINISH DAT	DEPTH	DEPTH \
B 00362	10W	22	4	1	4				238485	3923833		11/30/1956	3093	0
B 00363	10W	22	4	2	2				238885	3924033		4/30/1956	745	0
B 00373	10W	22	2	1	4				238502	3924660		12/31/1956	1003	0
B 00768	11W	17	4	2	4				225771	3916181	1/25/1980	1/30/1980	186	110
B 00847	11W	16	1	3	3				225982	3916566			0	0
B 00883	11W	17	4	4	2				225759	3915983			0	0
B 00894 X	11W	31	4	3	4				223946	3920637	6/1/1981	6/1/1981	0	80
B 00894	11W	31	4	3	4				223946	3920637	6/1/1981	6/1/1981	0	80
B 00894	11W	31	4	3					223847	3920738			0	0
B 00902	11W	31	0	0					223622	3921369			0	0
B 00920	11W	31	4	4	2				224365	3920823	11/16/1981	11/16/1981	120	60
B 00951	11W	31	4	4	4				224365	3920623	11/15/1981	11/15/1981	120	60
B 00962	11W	21	1	0					226236	3915281		12/31/1929	130	88
B 00963	11W	17	3	0					224665	3916125		5/25/1955	540	400
B 00964	11W	17	4	0					225462	3916098		7/31/1958	130	89
B 00970	11W	17	1	2	3				224799	3917001	6/8/1982	6/8/1982	205	60
B 00994	10W	22	2	1	4				238502	3924660		1/2/1958	827	0
B 01052	11W	4	3	4	3				226456	3918948			0	0
B 01053	11W	17	0	0					225067	3916527	3/1/1984	3/2/1984	200	60
B 01065	11W	17	1	2	3				224799	3917001	5/22/1984	6/4/1984	790	219
B 01091	11W	17	4	0					225462	3916098	10/21/1985	10/22/1985	243	115
B 01091	11W	17	1	3	3				224389	3916617	9/9/1991	9/12/1991	190	58
B 01160	11W	17	1	2	3				224799	3917001		1/1/1976	173	61
B 01161	11W	17	1	2	3				224799	3917001	9/14/1987	9/15/1987	123	60
B 01161	11W	17	1	2	3				224799	3917001	9/14/1987	9/15/1987	123	60
B 01161	11W	17	1	2	3				224799	3917001	9/16/1987	9/16/1987	70	54
B 01161	11W	17	1	2	3				224799	3917001	9/17/1989	9/17/1989	123	56
B 01161	11W	17	1	2	3				224799	3917001	9/17/1987	9/17/1987	123	55
B 01161	11W	17	1	2	3				224799	3917001	9/18/1987	9/18/1987	67	52
B 01161	11W	17	1	2	3				225771	3916181	9/16/1987	9/16/1987	70	60
B 01161	11W	17	1	2	3				224799	3917001	9/17/1987	9/17/1987	123	56
B 01161	11W	17	1	2	3				224799	3917001	9/17/1989	9/17/1989	123	56
B 01161	11W	17	1	2	3				224799	3917001	9/14/1987	9/15/1987	123	60
B 01161	11W	17	1	2	3				224799	3917001	9/16/1987	9/16/1987	70	60
B 01161	11W	17	1	2	3				224799	3917001	9/16/1987	9/16/1987	70	54
B 01161	11W	17	1	2	3				224799	3917001	9/17/1989	9/17/1989	123	56
B 01161	11W	17	1	2	3				224799	3917001	9/17/1987	9/17/1987	123	55
B 01161	11W	17	1	2	3				224799	3917001	9/18/1987	9/18/1987	67	52
B 01241	11W	17	4	2					225672	3916282			0	0
B 01254	11W	17	2	1	2				225397	3917188	5/12/1993	5/13/1993	205	120
B 01270	11W	17	1	2	3				224799	3917001	5/9/1994	5/12/1994	130	0
B 01283	11W	20	3	4	3				225020	3923813			0	0
B 01317	11W	17	1	2					225067	3916527			0	0
B 01326	11W	20	3	3	4				224824	3923827	3/11/1996	3/11/1996	185	40
B 01490	11W	20	3	4	4				225220	3923813			0	0
B 01491	11W	29	1	3	2				224807	3923218			0	0
B 01494	11W	20	3	4	3				225020	3923813			0	0
B 01605	11W	17	1	2	3	W	44	15	224799	3917001	5/22/1984	6/4/1984	790	219

Robin Brown, NMED, performed the work to make this table on July 26, 2005

REFERENCE 27

THE NAVAJO NATION
DEPARTMENT OF WATER RESOURCES
Technical, Construction & Operations Branch
P.O. Box 1936 ◆ Crownpoint, New Mexico 87313 ◆ (505) 786-2396 FAX: (505) 786-2398

Joe Shirley Jr.
President

Frank Dayish Jr.
Vice President

September 02, 2005

Robin Brown
Ground Water Quality Bureau
Superfund Oversight
Harold Runnels Building, Suite N2300
1190 St. Francis Drive
Santa Fe, New Mexico 87502

Dear Ms. Brown:

I've received a fax from Mr. Melvin Bedonie with our Department of Water Resources, Technical Construction & Operation Branch in Ft. Defiance, Arizona.

I am with Department of Water Resource, TCOB Eastern Agency office located in Crownpoint, New Mexico. I understand your doing an investigation on ground water wells. On the list provided by the state, the tribe O/M maintain and operate, mostly for livestock use only purposes some are active and non-active or abandoned wells, in spreadsheet 16T-551 is the only domestic water supply, we operate and maintain.

Therefore, I will forward a listed information from my office, if you have any question please call me at (505) 786-2396. Thank you.

Sincerely,

Bensen Benally Sr.

Bensen Benally, Sr.
Construction Supervisor
TCOB Eastern Agency Office

SEP-2-2005 12:58 FROM:CRPT WATER RESOURCES 505 786 2398 TO:9150582729 65 P:2/6

Well Status Black Jack Mine #1

1.	Tribe O/M	16T-325	Well – Livestock - Abandoned
2.	Tribe O/M	16T-325B	Well – Livestock - Abandoned
3.	Tribe O/M	16T-519	Windmill, Livestock – Active
4.	Tribe O/M	16T-610	Well Abandoned – Dry
5.	Tribe O/M	16-2-15	Dug well – Livestock – Active
6.	Tribe O/M	16-3-13	Dug well – Livestock – Inactive
7.	Tribe O/M	16-31	Dug well – Livestock – Abandoned
8.	Tribe O/M	16-41	Dug well – Livestock – Inactive
9.	Tribe O/M	16-6-6	Dug well – Livestock – Abandoned
10.	Tribe O/M	16-9	Dug well – Livestock – Abandoned
11.	Tribe O/M	16K-525	Well – Abandoned

Silver Spur Mine

1.	Tribe O/M	16T-551	Domestic Water Supply – Active
2.	Tribe O/M	16-2-6	Dug well – Livestock – Abandoned
3.	Tribe O/M	16B-38	Windmill – Livestock – Active
4.	Tribe O/M	16T-521	Windmill – Livestock – Active
5.	Tribe O/M	16T-552	Windmill – Livestock – Active
6.	Tribe O/M	16T-586	Well – Livestock - Abandoned